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CORRESPONDENCE.

More Regarding the Review of Moyer's The Steam Turbine.

Sir: The point of view taken by Mr. A. G. Christie in his review of my book on "The Steam Turbine" as well as in his later correspondence, is typically illustrated by his letter published in your issue of May 13, where he states

> the author would have us believe that an engineer would *build* a drum slightly over 3/16-in. thick and 25 ins. in diameter to run at 2,000 r. p. m. and to be grooved to carry rows of blades.

Now Mr. Christie again very carefully avoids clearly stating just what he takes exception to, but the author assumes that he means that a designer might be lead to believe that a general equation for the strength of a ring was intended for the *maximum* thickness and that with a thickness of 3/16-in. grooves could be cut of sufficient depth to allow the insertion of turbine blades. To a reader who has ever done any practical designing such an interpretation of the use of a designing formula will be obviously absurd. In order to find a loophole through which to escape from his errors Mr. Christie insists upon reading into the discussion matters that no intelligent designer would think of including. In the first place, in the review which he prepared, he tried to make this very same 3/16-in. apply to the thickness of the shaft. Failing in this because nothing was said about the shaft as applying to the equations in the discussion, he now tries to read in something else that is new and foreign. He wishes, apparently, to create the impression that the dimension calculated for the thickness of a ring on a rotating drum must in itself allow for some indefinite depths of grooves for the insertion of blades.

A thickness of 3/16-in. for a ring 25 ins. in diameter, with the usual blade load and moving at 2,000 r. p. m., does not seem unreasonable at all. I have designed a great many rings about 33 ins. in diameter which when rotating at 3,500 r. p. m. had to carry occasionally about the same sort of blade load. These rings were only about ⅛-in. thick, and no excessive elongation was observed.

Mr. Christie tries to explain his statements about economical superheat for steam turbines by claiming a typographical error. But how does he explain his general proposition in which he makes the broad claim that Curtis turbines will usually operate more advantageously with superheated steam than those of the Parsons type? I wish I could state without violating professional confidences just what engineers observe on this point who are daily testing such machines. It is only necessary, however, to put one question to settle this matter. Has Mr. Christie or any one else ever tested a Curtis turbine of a size comparable with Parsons turbines which showed a gain of more than 8% per 100° F. superheat? I have some data and the Westinghouse Machine Co. has records of many American turbines of the Parsons type giving a superheat correction of 10% per 100° F. superheat. Is not the conclusion therefore obvious? Because several important tests of Curtis turbines have been made with unusually high superheats there is no evidence to show that the economy of Curtis turbines is improved more per degree of superheat than Parsons turbines. In all my experience with Curtis turbines I never heard of an engineer of the General Electric Co., or of any of the Edison companies, claiming more than 8% per 100° F. superheat, and to me that value always seemed to be considerably above the average. In fact, 7% is not at all unusual.

In his latest communication Mr. Christie still insists that some of the leading turbines were not discussed impartially; in other words, that "one of the leading types of American steam turbines is discussed very generally in three pages." The writer thinks he understands pretty well which are the leading types of American steam turbines and the space each merits. The following table shows the pages allotted in the book to each type:

De Laval type	13 pages
Parsons type	18 "
Westinghouse impulse type	9 "
Curtis type	13 "
Rateau (Western Electric) type	8 "

Of the 18 pages devoted to the Parsons type, 6 pages is a general discussion, 6 pages relate to the peculiarities of the Westinghouse-Parsons design, and 6 pages to the Allis-Chalmers modification of this type.

James Ambrose Moyer.

Pennsylvania Bldg., Philadelphia, May 23, 1909.

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REVIEWS.

The Panama Canal from Various Points of View.

THE PANAMA CANAL AND ITS MAKERS.—By Vaughan Cornish, D. Sc. (Manchester Univ.), F. R. G. S., etc. Boston, Mass.: Little, Brown & Co. Cloth; 5¼ × 8¼ ins.; pp. 192; 33 plates. $1.50, net.

The author of this book is an English geographer who visited Panama early in 1907 and again in April, 1908. He has given an unprejudiced account of the things which he saw on the Isthmus. In some respects Mr. Cornish's account is deficient, owing to his lack of technical knowledge, but he has succeeded in making a concise and readable summary of the work which has been done and is being done on the Isthmus. It must be confessed that his work compares more than favorably with the matter published by most American newspapermen and book writers who have visited the Isthmus.

Mr. Cornish himself refers in his Introduction to "the doubts thrown by American writers, and also by Americans of repute, in conversation, upon the reliability of official and other information supplied to the American public on the burning topic of the Isthmus," and says:

> As an Englishman, and therefore standing outside American party politics, and as a scientific student not engaged in commerce or political life, I came to the study of the subject without prepossessions. This at least was my happy state when I arrived in Washington in March last. When I left for the Canal Zone a month later I was filled with gloomy forebodings that I might after all find a rotten state of affairs on the Isthmus. It was with intense relief that I found that I had what is called in America "an honest proposition" to deal with. As my doubts hitherto had been due to the patriotic anxiety of their compatriots, I am sure Colonel Goethals and his colleagues will forgive me for this frank statement of my difficulties and their solution.
>
> Any Englishman, accustomed to see the work of our own soldiers and civil servants in the Crown Colonies or in Egypt, would recognize in the officers of the Corps of Engineers and of the Army Medical Corps who are in charge of the Canal Zone, men of a like high standard of duty.

Mr. Cornish's first chapter is a historical review of the canal enterprise. Its brevity has made necessary the omission of much important matter, and a better selection might have been made in some respects; for example, more might have been given regarding the Nicaragua project.

On page 32, referring to the work done by the De Lesseps company, Mr. Cornish says

> A large part of the work required for a tide-level canal was well executed on sound lines by the genius of the French, who are excelled by none in the arts of the civil engineer.

This is giving considerably more praise to the work done by the De Lesseps company than is due. While there were some capable engineers on the Isthmus at that time, they were so badly handicapped by the powers in control that efficiency was impossible. The work under De Lesseps was carried on to make a big showing in the way of yardage, rather than to carry out the work of construction on proper engineering lines. It is true, as Mr. Cornish says, that the Americans now on the Isthmus give full credit to the work of the French *engineers*; but they are not blind to the terrible botch which was made by the De Lesseps management.

Following chapters of the book describe the plan of the canal, with a few pages on the reasons for the adoption of the lock plan. Mr. Cornish, although not an engineer, appears to have gained a fairly clear idea of engineering matters. A few errors, however, may be noted. On page 72, he states that the hill through which the Gatun Dam spillway is being constructed "is not the hard argillaceous sandstone of the lock site, but merely alluvial." This is an error, as the rock of the spillway hill is almost identical with that of the adjacent lock pit.

The reader of Mr. Cornish's book must bear in mind that it is written from observations made in April, 1908, and many changes have since taken place. For example, in discussing the geological gorges underneath the Gatun Dam, Mr. Cornish does not mention that the later diamond drill borings show these gorges to be filled clear to the bottom with impervious material. One paragraph of Mr. Cornish's, on page 89, in which he describes the impression made on the visitor who watches the work in the Culebra cut is well worth quoting.

> I paid many visits to the Cut, between Empire and Pedro Miguel, but oftenest at Culebra itself. The sight never palls, and is one of the wonders of the world. The pyramids are another wonder of the world which in common with many thousands in all ages I have thought it worth going to see—but to go to Culebra is as if one were privileged to watch the building of the pyramids. Yet how few go to the Isthmus on purpose to see these things, and, *mirabile dictu*, how few Americans! How is it that this people, so enthusiastic in all that relates to national achievement and addicted to foreign travel, does not include the Isthmus among its many recognized places of pilgrimage? Of the Americans whom I met on the Zone there was scarcely one who had come voluntarily for pleasure.

Mr. Cornish's chapters on "The Men on the Isthmus" and "Health on the Isthmus" are particularly commendable.

In his chapter on "The Shortening of Distances by Sea," he concludes that, because America has practically no ocean-going merchant marine the canal will benefit other nations more than the United States. This, however, is a superficial view. Competition in the ocean-carrying trade constantly cuts down rates of freight and passage to the point where the ship owner receives nothing more than a moderate return on his capital invested. The benefit from the construction of the canal will accrue chiefly to the shippers of the world, and eventually to the final consumers. Inasmuch as the shortening of distances by sea, because of the construction of the canal, will be most effective with reference to distances from United States ports, it follows that the great bulk of the traffic through the canal will be directly beneficial to the people of the United States.

FOUR CENTURIES OF THE PANAMA CANAL.—By Willis Fletcher Johnson, Author of "A Century of Expansion, etc. New York: Henry Holt & Co. Cloth; 5½ × 8½ ins.; pp. 461; 16 plates and 6 maps. $3, net; by mail, $3.27.

The purchaser of this book who expects to find a record of the Panama Canal work from the engineering standpoint will be disappointed. If he is looking, however, for a history of the enterprise from the standpoint of international politics and diplomacy, he will be well repaid. The only other source that we now recall, which can compare with this as a history, is the report of the Isthmian Canal Commission of 1901. That report, however, is greatly condensed compared with this volume.

We note some inaccuracies in statements regarding the Nicaragua enterprise. Thus, on page 112, referring to the original Maritime Canal Co. of Nicaragua, the author intimates that the company would have probably had no difficulty in securing the necessary capital to build its projected canal had not the financial stringency of 1893 occurred.

This may well be questioned. As a matter of fact, the company made strenuous efforts to raise money for its enterprise long before the panic of 1893, and the result of these efforts was such as to make it certain that American financiers would not furnish the money for a trans-isthmian canal without some form of Government guarantee.

On the following page it is stated, regarding the work of the Ludlow Commission of 1895, that it reported the Maritime Canal Co.'s plans to be feasible.

This is wide of the mark. The gist of the Ludlow Commission's report was that a canal at Nicaragua was probably feasible but would cost fully double what the Maritime Co. had estimated, and that there was no certainty whether it would or would not be feasible or what the cost would be until very extensive surveys had been made.

We have stated above that the book is strong on the historical rather than the engineering side. As an illustration of this we may mention that out of the total 440 pages, only two chapters, or a total of 45 pages, are devoted to the actual work under the American regime; and a large part of the space in these two chapters is devoted to organization, personnel, etc.

On page 282 the author gives a rather misleading idea as to the work done by the De Lesseps company and as to the value of the old French machinery which we purchased. He says: "Practically all their excavation work can be utilized, whether in the great cut at Culebra or on the tidal flats where the canal is already navigable."

While it is true that most of the work in the Culebra cut was effective, it must be remembered that many of the spoil banks which the French made there have had to be moved by us a second time, and have been a fruitful cause of slides. Besides this, the yardage of excavation made by the French was largely on the sea-level section between Colon and Bohio, and on the diversion channels in the same section. Very little of this work will be of any use to us in carrying out the present plan of construction. As for the value of the French machinery, it is true that several French dredges and scows have been recovered and put in service, and that in the early years of our work the old French cars and locomotives were used because of inability to secure prompt delivery of American rolling-stock. If we had had to pay anything for this old material, however, it would have been worth while to make use of very little that has been reclaimed.

It should be noted that this book was completed by the author in October, 1906, according to the preface, and nothing is said of course, therefore, of the important engineering work and the rapid progress which the last two-and-a-half years on the Isthmus has recorded. The remarks of the author upon the type of canal adopted are also to be interpreted with reference to the time at which the book was written.

THE PANAMA CANAL AS A BUSINESS VENTURE.—By George L. Fox, Author of "President Roosevelt's Coup d'Etat—The Panama Affair in a Nutshell." Paper; 8 × 10¼ ins.; pp. 15. 10 cts.

This pamphlet contains nothing to show by whom it is published, and we are at a loss to know by whose enterprise it is printed and distributed. It does not seem reasonable to suppose that anyone would venture upon its publication as a money-making enterprise, and suspicion is naturally aroused as to whether it is not circulated by some interest opposed to the canal work.

The object of the pamphlet is to show that, so far as returns from tolls on merchant vessels are concerned, the Panama Canal will be a losing venture for the United States. The author makes no mention of the fact that a great saving can be made in our naval expenditures, if the canal will save to a considerable extent duplication of our Atlantic and Pacific fleets.

It is hardly worth while to discuss Mr. Fox's pamphlet seriously, since he does not take pains to go to authoritative sources for the data on which he bases his argument, but appears to take data from any published source that suits his argument without regard to its reliability. By way of illustration, we give the following quotation:

> Very little actual construction work has been accomplished. Mr. Lindon W. Bates, one of the best equipped and most expert writers on the canal, asserts that 5% of the necessary material to be moved and placed has been moved and placed.

"Expert writers on the canal" is good!

Elsewhere in the pamphlet Mr. Fox attempts to prove that freight can be transhipped from steamer to railway car, and vice versa, so cheaply that it was not needful to build the canal at all. He assumes a cost of 30 cts. a ton for handling freight between steamship and railway car at both ends of the canal, or 15 cts. a ton for each transhipment. Thus he reaches the conclusion that the Panama Railroad really made a Panama Canal unnecessary. This is a good illustration of the muddle produced when an amateur attempts to handle technical matters concerning which he has only a smattering of knowledge.

If it were possible to tranship freight at any such small cost, the Suez Canal would be a mistake.

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Efficiency and Cost of Heat-Engine Power Plants—The Mechanics and Thermodynamics of Gases and Vapors.

Reviewed by LIONEL S. MARKS,* M. Am. Soc. M. E.

NEUERE KRAFTANLAGEN.—Eine Technische und Wirtschaftliche Studie auf Veranlassung der Jagorstiftung der Stadt Berlin. Prepared by E. Josse, Professor in the Royal Technical College at Berlin. Munich and Berlin, Germany: R. Oldenbourg. Stiff paper; 6¾ × 10 ins.; pp. 107; 55 illustrations in the text. 4 marks; American price, $1.60.

TECHNISCHE WAERMEMECHANIK.—Die für den Maschinenbau Wichtigsten Lehren aus der Mechanik der Gase und Dämpfe und der Mechanischen Wärmetheorie. By W. Schüle, Oberlehrer an der Kgl. Höheren Maschinenbauschule, Breslau. Berlin, Germany: Julius Springer. Flexible cloth; 6 × 9½ ins.; pp. 364; 4 plates and 118 text illustrations.

Professor Josse presents an interesting and valuable comparative study of the efficiencies and costs of power in various heat-engine power plants of moderate size located in Germany. This study is designed to show the present state of the art and to be a guide in the selection of type of plant, to those about to make an installation.

The book is divided into five parts dealing with (1) the properties and costs of the solid and liquid fuels that are available for power purposes; (2) the attainable efficiencies in the various types of heat engine as shown by investigations; (3) the actual fuel consumption and running costs of existing plants; (4) first costs of power plants; and (5) the arrangement and space required for different types of existing plants. As can be seen from this statement of the outline of the book the matter dealt with is of prime importance to the engineer and contains the kind of information that is generally difficult to get until it is too old to be useful. The particular facts and figures given will, of course, prove more useful to the German engineer than to others, as the costs of fuel, attendance, first costs and other quantities apply only to German conditions, but nevertheless there is much of value to all engineers.

The costs of fuel in Berlin, on which the principal results are based, are the existing costs at the end of 1908. Per 10,000 calories they are, for bituminous coal about 3 pfennigs; brown coal briquettes, 3.7; coke, about 4.8; anthracite, 4.4 to 5.3; coal oil, 9.5; gasoline, 25.5; denatured alcohol, 56; and naphthaline (used as a liquid after heating), 12 pfennigs.

The section on attainable efficiencies contains a valuable condensed discussion of the distinctive features, cost and relative advantages of different types of boilers and boiler appurtenances, of various types of steam engines, and of various types of steam plant as a whole. The results of tests at full and partial loads are given, and the losses of certain parts of the plant such as the steam piping are stated. The tables of the guaranteed and test performances from 20 steam engines and of a similar number of turbines of various makes and sizes are given in a particularly useful form. Suction-gas plants are treated in a similar way. It is interesting to note that all the 17 suction plants for which full-load test figures are given, covering sizes from 25 to 700 HP., convert from 20 to 25% of the heat of combustion of the coal into indicated work; the efficiency of the generator varies from 75 to 83%, and of the engine from 26 to 28%. The author states that an efficiency of 88% or even more is possible for the generator, and points out that the efficiency of the whole plant is but slightly affected by the size of the plant. The rapid falling off in efficiency of suction plants with decrease in load is also pointed out—the consumption of fuel per brake horsepower is increased 50% at half load and 100% at quarter load. The stand-by losses are given as only 2 or 3% in the ordinary plant. Other points discussed for suction plants are the attendance required, the overload capacity, the amount of cooling water required, the cleaning and repairs, the available fuels, the disposal of the scrubber water and other matters.

The short treatment of the Diesel motor is interesting in view of the present rapid improvement and spread of these motors. The results of new tests are given at various loads and show an efficiency of 32 to 34% in terms of the useful work at full load, falling to about 29% at half load. Small gasoline and other oil motors are next taken up; the tabulation of test results shows efficiencies in terms of useful work as high as 24% at full load and falling to about 16% at half load and 11% at quarter load. The Deutz naphthaline motor gives similar figures and in view of the present cost of that fuel it would seem to offer a promising future. A comparative graphical summary of the efficiencies of the various types of motors shows at once the relations of the various types.

The remainder of the book contains tables and drawings showing the costs of operation and installation of existing plants and the general arrangement of the plants. Complete data are given of the actual costs of 25 steam plants, 13 gas plants and 7 Diesel plants, and including the work done per year, the cost per KW.-hr. for fuel, for supplies, for wages, for upkeep, and the total costs. The sizes of the plants are from 30 to 900 HP. For each kind of power curves are drawn showing the relation of the costs to the work done per year; the relation of the actual fuel consumption to test results; and various other important quantities.

The information collected on the actual layout of various plants is made to yield a series of curves which show the floor space and head room required for the different types of motive power, for engines of various sizes. An appendix gives the details and results of tests of an 8-HP. naphthaline motor and a 100-HP. suction gas plant.

The arrangement of this book is admirable, the data are apparently reliable, and the whole is presented with a conciseness that is most attractive. It is a practical, useful work.

In his preface Prof. Schüle announces that the purpose of his book is to set forth in a simple, easily-understandable form those fundamental laws of the mechanics of gases and vapors, and of thermodynamics, which are most important for the mechanical engineer. He announces, also, his attention of maintaining throughout a close relation with practical problems. An examination of the book shows that he has been successful in both these directions and, moreover, has been able to add a number of useful contributions to the science with which he is dealing.

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The book is in three parts, dealing with (1) the properties of gases; (2) the properties of vapors, including the phenomena of the flow of vapors and gases; and (3) the fundamental theorems of thermodynamics. The subject matter is not, however, as distinct as this primary division would indicate. For example, the first law of thermodynamics, the conception of entropy, the calculation of the efficiency of gas-engine cycles and other matters which are usually introduced under the caption of thermodynamics, are brought in very simply and properly in the discussion of the properties of gases. By the time the reader gets to the third section he has done already the greater part of the thermodynamics without having been informed of that fact. This consideration for the natural diffidence of a student approaching a science with so evil a reputation as thermodynamics is most unusual, particularly in a German text-book.

The absence of the common formal method of handling the subject, in particular the absence of a deduction of the general thermodynamic equations followed by several pages devoted to expressing the thermodynamic relations in terms of all the conceivable permutations and combinations of the physical coördinates, renders this book much less repellent to the engineering student than most of the German books. The great difference between the usual methods of treatment of the elements of thermodynamics by Continental and by English-speaking professors would appear to indicate fundamentally different types of mental process in their respective students. The present book forsakes in many respects the accepted Continental methods and approximates to the best English models. In general, it combines the best features of both.

The mathematical treatment is everywhere simple. Where possible geometrical methods are substituted. An excellent feature is the working out of numerous examples throughout the book. The figures are all to scale, very clear, and many of them extremely useful. This is particularly true of the four full-page diagrams. Two of these diagrams deal with gases; the others with steam. The first diagram has curves of the total heat of various gases expanding either at constant pressure or at constant volume, on the assumption of variable specific heats. The second diagram is a new and ingenious diagram for finding the changes in pressure, volume and temperature during the adiabatic expansion of any of the permanent gases, with variable specific heat; this diagram is most valuable for facilitating calculations. The third and fourth diagrams are Mollier and temperature-entropy diagrams for saturated and superheated steam, using the Knoblauch values for the latter.

The values given throughout the book are well chosen and show in many cases a close study of the most recent investigations. Langen's values are used for the specific heats of gases. The work of Eberle and of Fritzsche on the flow, in pipes, of steam and of air, respectively, and the work of Frank on air resistance have been incorporated and lead to a new theoretical determination of the law of air resistance. The numerous researches on the flow of steam and the resistances in a steam turbine are presented and discussed.

The author is to be congratulated on having made a book which is well adapted both to class-room work and for self study, and which should be found as useful to the practicing engineer as to the student.

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POCKETBOOK OF USEFUL FORMULAE AND MEMORANDA FOR CIVIL, MECHANICAL AND ELECTRICAL ENGINEERS.—By Sir Guilford L. Molesworth, M. Inst. M. E., Past President Inst. C. E., and Henry Bridges Molesworth, M. Inst. C. E. 26th edition, revised and enlarged, with an Electrical Supplement by Walter H. Molesworth, M. Inst. E. E., M. Inst. M. E. London, England: E. & F. N. Spon, Ltd. New York: Spon & Chamberlain. Flexible leather; 4½ x 3 ins.; pp. 901; numerous text illustrations and tables. $2.

In our review of the 25th edition of this veritable "pocket" book (Eng. News, Aug. 18, 1904, p. 161) we said that it was prepared by Englishmen for Englishmen only and that it was in need of a thorough revision to bring it down to modern practice. The former criticism still holds for the 26th edition, but there are many evidences that the latest revision has been made with the idea of modernizing many of the antiquated statements in the previous editions.

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Details of Mill Engineering.

MILLWRIGHTING.—By James F. Hobart. New York and London: Hill Publishing Co. Cloth; 6 x 9½ ins.; pp. 401; 141 illustrations in the text. $3, net.

This big volume is intended for the sort of a person whom the author describes as

> A wide-awake man who works with brains as well as with his hands. He is supposed to take the more or less perfect plans from the designing engineer—who desires to reserve the title of C. E. or M. E. entirely for himself and who often refers to the millwright as a "carpenter"—to execute these plans and in many instances to complete the details and most if not all the minor engineering, to finish the work of the designer, to cover his mistakes and to help him out generally.

The author develops his topics under the supposition that the millwright has to decide many important details himself, with little or no help from the designer, or has to scrutinize the plans to find places where construction can be cheapened and simplified.

The author begins by telling how a factory location would be selected and how the buildings would be laid out so that the course of material through the whole plant is forward in one general direction. A succeeding section goes, with detail, into the laying out of the foundations into the erection of the batter boards, into the use of the engineer's and carpenter's levels on foundation work and into all such early construction in the building of a manufacturing plant.

The theory underlying the proportioning of wall and machinery foundations is rather briefly stated as an aid to the millwright in checking over the drawings that come to him. Right here are added practical points, first gained by experience, on modifications that can often be made on the foundations, as designed, to make them simpler and cheaper.

The millwright may become a general inspector of erection, the author assumes. How to inspect, to secure the best work and still not to antagonize the contractor unduly, is plainly told. Here is the author's key:

> There are many things which can be done a little different than called for in the specifications and still be as good, and perhaps a little better, and not cost the contractor half as much. The give-and-take method of inspecting. This is the best method. It makes the contractor into a friend who will do anything to help the inspector and who will not do one thing when the inspector is present and another thing when that official's back is turned.

In introducing the art and science of framing the author compares, in detail and at length, the three important classes of wooden structures that have characterized the development of factory practice: (1) old-fashioned timbering; (2) balloon framing, and (3) slow-burning construction. The economy and dispatch of the new ways of joining and framing are demonstrated. When the author reaches the subject of roof timbering and trusses he gives a simple experimental demonstration of the parallelogram of forces and from this leads up to the theory of stresses in various trusses and to the essential requirements followed in proportioning the parts to carry the loads imposed. This elementary discussion of theory is followed by a grist of practical suggestions for roof covering.

The author delves into the strengths of various materials and then carries the results of the discussion into homely applications such as the bearings of daps and bolts, plates and journal supports, the shearing away of wood and iron heads.

The matter thus far described fills half the volume and is followed by sections almost wholly related to the installation and adjustment of machinery. First comes the laying out of the line and countershafts and their proper hanging. Then follow the multitude of smaller jobs: fitting the pulleys, stretching the belts, setting up the engines and heavy machines, the alining and adjusting of all these for smooth running. In nearly every case where any logical course can be followed, rather than a "rule of thumb," the theory is given as simply and clearly as any intelligent, ambitious workmen could desire.

The book is written for master builders, the author states, but it will prove of equal service to any young engineer who needs to go out onto factory construction from time to time. The statements of theory for a workman's point of view should be novel and often illuminating. It will help put one in a way to see the builders' opinions of a designer's ideas. The pages abound in homely suggestions which, in most cases, quickly strike home to the reader.

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CONSERVATION OF NATURAL RESOURCES.—Philadelphia, Pa.: The American Academy of Political and Social Science. Paper; 6¼ x 9¼ ins.; pp. 226. $1.

This publication, issued by the American Academy, may fairly be regarded as the most important contribution thus far made to the literature of conservation. The material contained in it is of permanent value and deserving of careful study by all who are interested in the important movement initiated by President Roosevelt through the memorable conference of Governors in May, 1908. The monograph is divided into four parts. Part I. relates to public forestry on private lands, and the contributors to it include Hon. Gifford Pinchot and Prof. Henry S. Graves, Director of the Yale Forest School; while the state regulation of private forests from a legal standpoint is discussed by a prominent attorney of New Orleans.

Part II. relates to water resources and water-power, and the most important question discussed is the extent to which state and national governments can control water-power development and secure on the one hand the utilization of this great natural resource and on the other public rights to its use, without paying undue tribute to monopolistic control. Among the contributors to this section are Mr. M. O. Leighton, Chief Hydrographer of the U. S. Geological Survey; Mr. Charles E. Wright, Assistant Attorney in the Interior Department; and Mr. Charles Whiting Baker, of Engineering News.

Part III. relates to conservation and use of land resources, and included in this section is the work of the Reclamation Service, which is set forth by Hon. Frederick H. Newell and Mr. Morris Bien, Supervising Engineer. Other contributors to this section are Senator Nelson, of Minnesota, and Prof. Cyril G. Hopkins, of the University of Illinois.

The concluding section of the book is devoted to the conservation of mineral wealth, and the three contributors are Hon. George Otis Smith, Director of the U. S. Geological Survey; Dr. J. A. Holmes, Chief of the Technologic Branch of the Survey; and President Van Hise, of the University of Wisconsin. The last-named writer makes a strong appeal for the conservation of mineral phosphate deposits, and also of soil fertility generally. He urges that the life of the human race is dependent upon phosphorus more than upon any other element. His paper deserves most careful study.

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REPORT TO THE BOARD OF TRUSTEES, "COMMISSIONERS OF WATER WORKS," OF CINCINNATI, OHIO.—By Geo. H. Benzenberg, Chief Engineer. A Brief History of the Old Water-Works, Leading Up to and Including the Construction of the New Water-Works by and Under the "Commissioners of Water-Works." (Cincinnati, Ohio: Board of Trustees.) Cloth; 9 x 12½ ins.; pp. 267; numerous folding and other plates.

As many of our readers know, Cincinnati was one of the pioneers among the larger cities of the country in establishing water-purification works. The volume before us describes those works and the river intake tower and tunnel, the pumping stations, and the conduit to the city. The volume opens with a brief history of the Cincinnati water-works. It then gives in some detail an account of the steps which led up to the building of the purification works, including a summary of the various engineering reports and of the report on filtration experiments. The construction work carried out during the past ten years, at an expense in round numbers of $10,000,000, is described in detail. The operation of the purification works for the year 1908, which was the first full year of use, is described and summarized interestingly. The works include two very large settling basins, besides coagulating basins, mechanical or rapid filters, and a clear-water basin. Lime and sulphate of iron are employed as coagulants. The volume concludes with reproductions of a large number of photographs and line drawings. Altogether it is a very creditable record of one of the most important pieces of recent engineering construction in the United States.

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Steinmetz on Transient Electrical Phenomena —Other Electrical Books.

Reviewed by HENRY H. NORRIS.*

THEORY AND CALCULATION OF TRANSIENT ELECTRIC PHENOMENA AND OSCILLATIONS.—By Charles Proteus Steinmetz. New York: McGraw Publishing Co. Cloth; 6 × 9½ ins.; pp. 556; 102 illustrations in the text. $5, net.

STATIONARY TRANSFORMERS.—Theory, Connections, Operation and Testing of Constant-Potential, Constant-Current, Series and Auto Transformers, Potential Regulators, etc. By William T. Taylor, M. Am. Inst. E. E., M. Inst. E. E. New York: McGraw Publishing Co. Cloth; 4¾ × 7½ ins.; pp. 169; 107 illustrations in the text. $1.50, net.

A STUDY OF ELECTROTHERMAL AND ELECTROLYTIC INDUSTRIES.—By Edgar A. Ashcroft, M. Inst. E. E., Assoc. M. Inst. C. E., etc. Statistics by I. J. Moltkehansen, Dipl Ing., Berlin. In three parts. Part I.: Introductory. New York: McGraw Publishing Co. Cloth; 6 × 9½ ins.; pp. 130; 37 illustrations, mostly in the text. $2, net.

Dr. Steinmetz's new book, "Transient Electric Phenomena and Oscillations," is a companion to his well-known "Alternating Current Phenomena," of which the fourth edition was recently issued. It is impossible to convey an impression of the wealth of information and suggestion contained in the new work. It is undoubtedly the great electrical book of the year and from its nature is bound to take its place among the standard books in its line. It is divided into four main sections as follows: (1) transient phenomena in time; (2) periodic transient phenomena; (3) transient phenomena in space; (4) transient phenomena in time and space. The many phases of the subject are covered in 36 chapters, each of which begins with a clear, non-mathematical statement of the physical principles underlying the phenomena under discussion. To understand these introductions the reader must be familiar with the construction of the apparatus and with the general characteristics of the field of electrical engineering in which the phenomena occur. Following the introductions are complete mathematical analyses of the phenomena.

As would be inferred from these statements the book is not one for beginners. Before it is studied, a familiarity with Dr. Steinmetz's "Theoretical Elements of Electrical Engineering" and his "Alternating Current Phenomena" is highly desirable. The properly prepared readers will be delighted with the clear exposition of the physical principles even if he is not able to follow the complete mathematical proofs. The numerical illustrations and the numerous curves and other diagrams greatly add to the interest of the reader and will suggest helpful experiments to those who have laboratory facilities at command.

The term "transient phenomena" is applied to those phenomena which are not periodic; that is, which die away either with time or with distance. For example, when an electromotive force is applied to the terminals of a circuit the current does not reach a steady value instantly because some time is needed to set up the magnetic field about the circuit or to charge the dielectric between the conductors of the circuit. The circuit has resistance which limits the flow of the current and hence the rate at which energy can be stored. This is a transient phenomenon for, if the applied e. m. f. is a direct one, the current soon settles down to a uniform value; while, if the e. m. f. is alternating, the current in a short time takes up a periodic value corresponding to that of the periodic applied e. m. f. A very important transient phenomenon is that of the oscillating currents used in wireless telegraphy. The discharge of an induction coil across a spark gap sets up oscillations which die out rapidly. Successive discharges supply new energy to the oscillating circuit, keeping up an intermittent supply of electric waves. Still another transient phenomenon is observed in the starting of a self-excited direct-current generator. When the machine starts from rest there is only the remnant magnetism in the field circuit available for the production of electromotive force. The small e. m. f. produced by this sends a small current through the field winding. This produces more flux which produces more e. m. f., and the machine soon "builds up" the normal e. m. f. These illustrations indicate phenomena which are transient in time. Other phenomena are transient in space; for example, those which occur when the electrical conditions are different at different points in a circuit. When a lightning discharge occurs at some point in a transmission line, there is a piling up of the electric charge at this point. The potential at the point instantly rises and the charge begins to flow away from the point in the form of a current. As the circuit has resistance and inductance the charge cannot be carried away instantly, hence there is an uneven distribution of charge and potential along the line. This is a phenomenon transient in space. It is interesting to note that this, in turn, sets up phenomena which are transient in time. As the electrically stored energy tends to distribute itself by the setting up of current, it stores energy in magnetic form about the circuit. This requires time. The energy comes back into the circuit as the current is reduced and thus raises the potential again. In other words, oscillations are set up in the circuit and these require a time to die out.

The term "periodic transient phenomena," which is the title of the second section of the book, requires explanation as the two words seem contradictory. Whenever a sudden change occurs in an electric circuit transient phenomena result, as already explained. If such sudden changes occur periodically, for example by the sudden periodical reversal of the current, there results a periodic repetition of the phenomena. To such cases Dr. Steinmetz applies the term "periodic transient phenomena." The examples treated in the book are those resulting from the mechanical rectification of current as in the arc light machine, and the mercury arc rectification which is now attaining such practical importance.

The examples given above will serve to show the importance of a knowledge of transient phenomena on the part of the electrical engineer who wishes to keep pace with the present rapid advance in the science and art of electrical engineering in all of its branches.

Dr. Charles P. Steinmetz occupies a unique position among electrical engineers. He is their leading mathematician and at the same time he is consulting engineer of the largest electrical manufacturing company. Further, he is the head professor of electrical engineering at Union University. He may be aptly termed the dean of the professors of electrical engineering in this country. The results of Dr. Steinmetz's experience and study are always at the disposal of his electrical fellow-workers. He has the happy faculty of putting his thought clearly and forcibly. No meeting of the American Institute of Electrical Engineers is complete until Dr. Steinmetz has had an opportunity to sum up the discussion in his inimitable way and to state his own conclusions regarding the topics under consideration. As there are few electrical subjects to which he has not devoted careful thought, his experience in analysis enables him to ignore the superficial aspects of the matter in hand and to proceed at once to fundamentals. On account of the unselfishness of his nature, combined with his rare mental gifts and acquirements, Dr. Steinmetz is regarded with affection and respect by his wide circle of professional acquaintance. At the age of forty-five he has already accomplished a large life-work and there seems to be no limit to the possibilities ahead.

While the two books on Transformers and on Electrothermal and Electrolytical Industries treat of entirely different subjects, they have been grouped together for the purpose of review because they illustrate a tendency in technical book-making which is open to criticism. Each is fragmentary and of small size but is sold at a price per page which is extremely high. One contains 169 small pages of text and illustration and is priced at $1.50, net, or 0.89-ct. per page. The other contains 130 larger pages and costs, at $2, net, 1.54 cts. per page. The composition and binding in each case are not expensive, so that compared with larger books the purchaser pays a proportionately large sum for what he receives. In some cases this would be justified; for example, if the books were of such a nature as to appeal to a small circle of readers. The price per page is not a guide in the case of very expensive composition, such as intricate mathematical text, or tabulated data. In the present case, the books are of a general nature and presumably will circulate well, and there is nothing in their make-up to indicate excessive cost of plates. Only in exceptional cases should very small books be published, as they are inconvenient to use for reference and they are, from the purchasers' standpoint, inefficiently manufactured. One of these volumes (Ashcroft) is the first of three parts. At the same rate, the complete work will cost $6 and will contain 390 pages. Dr. Steinmetz's "Transient Phenomena," reviewed in the foregoing paragraphs, contains 556 pages and costs $5 net. It contains a large proportion of expensive mathematical composition. As the binding, paper and general style of the two books are practically the same, the "publication efficiency" of the moderately large volume is clearly demonstrated.

The title of Mr. Taylor's book is misleading, in that it implies a general treatment of the subject "Stationary Transformers." As a matter of fact, the author has confined his attention to a small part of this subject. The larger part of the book is occupied by diagrams and descriptions of transformer connections for a variety of conditions. These will prove convenient for both the transformer user who is familiar with the design and construction of standard apparatus, and for the one who desires to use such apparatus without a knowledge of the theory of its operation. By following the directions carefully the latter will be able to avoid mistakes in connections which might prove dangerous to the insulation of the transformers. It should be understood, however, that in general the proper application of transformers for power transmission requires a high grade of technical skill which cannot be obtained by reading books.

The plan followed by the author is largely descriptive. With the exception of the liberal and necessary use of vector diagrams it is non-mathematical. After a very brief review of underlying principles the author takes up, in short chapters, the standard systems of circuit connections used in single and polyphase circuits. An instructive chapter is that devoted to three-phase difficulties. In this is shown the possibility of the occurrence of abnormal electromotive forces through the grounding of the circuit, or the short-circuiting of part of the current. A chapter on transformer testing concludes the book. There is no index, but, as the chapters are very short and as there are a brief table of contents and a longer list of illustrations, there should be no difficulty in finding any desired subject. The quality of the material is fairly satisfactory but, as indicated above, it should form a part of a complete work on transformers rather than a book itself.

Under the title "A Study of Electrothermal and Electrolytic Industries," Mr. E. A. Ashcroft proposes to supply information regarding industrially successful processes in electrochemistry and electrometallurgy. He states that the lack of such information, on the part of those not practicing the various specialized branches of the industry,

> is due to our commercial conditions, which make it necessary for individual producers to jealously guard their secrets from their competitors, to the great detriment of the advance of the industries as a whole.

No claim for great originality in material is made, but the author, from his wide and varied practical experience as an engineer and a manager of manufacturing plants, hopes that he may be able "to fill a want not yet filled by existing text-books." The introductory volume promises well, although it lacks condensation. There is also a philosophising tendency which distracts from the main purpose of the book. The opening sentences indicate this.

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> Hiding behind an impenetrable veil of mystery, the forces of nature have worked their relentless destinies unremittingly and unchanged, since the unknown and unthinkable origins of their being.
>
> Whatever the precise order of events in the grand cosmological drama of creation; whatever the true interpretation of the periods of the geological epochs; whatever the real order and nature of the origins of organic species; whatever the origin and destiny of the human intelligence, one thing is now fixed, and endowed with the quality of certainty in its relation to the human understanding. This fundamental truth is the undisputed and absolute reign of objective law and order in the universe in which we live.

It would be unjust to the author to imply that this imagery is sustained throughout the book. It is not, but the illustration is chosen to indicate the rather "expansive" style of the text.

As its sub-title indicates this volume is preliminary in character. It is devoted to historical statements; to the fundamental theoretical and mathematical principles; to the elements of electrochemical and electrothermal process; to some features of the design of industrial plants; and to the methods of cheap energy production. A knowledge of elementary chemistry is sufficient to enable the reader to follow the discussion. In Parts II. and III. is promised an alphabetical arrangement of all industrial operations of electrometallurgy and electrochemistry with respect to the several elements which it is, in general, the aim of the processes to liberate from their compounds. Such material should be useful if complete and authoritative, as this will presumably be.

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The Note-Book of a Reinforced-Concrete Constructor.

THE REINFORCED-CONCRETE POCKETBOOK.—Containing Useful Tables, Rules and Illustrations for the Convenient Design, Rational Construction and Ready Computation of Cost of Reinforced-Concrete Girders, etc. By L. J. Mensch, M. Am. Soc. C. E. San Francisco, Cal.: The Author (Monadnock Building). Flexible leather; 4 × 6¼ ins.; pp. 216; 88 illustrations in the text. $10.

Of all the numerous "handbooks" and "pocketbooks" on concrete which the past few years have brought forth, this one, in its intention and execution, is more nearly like the standard steel handbooks such as are issued by the Cambria and the Carnegie Steel Companies than any of the others. It is a series of tables—originally compiled for the personal use of the author and tested by him through a number of years' actual construction—by means of which the more mechanical processes of computation may be simplified. Like the standard steel handbooks, this book assumes a previous knowledge of the theory and practice of the construction with which it deals and confines all attention to the tabulation of data. A brief review of the contents will probably be the best way of describing the book.

The first table gives the weights and areas of various numbers and sizes of reinforcing rods. This is followed by a series of tables on T-beams, giving bending moments, dimensions, and weights and areas of steel and concrete of such beams, from 3½ × 6¾ ins. to 14 × 23½ ins. in section. Then similar data are given for flat slabs, wall footings and column footings, in great variety of size and shape. Reinforced-concrete columns, both with longitudinal and with hooped reinforcement, come next. Under the heading "Floor Construction," there are tabulated the various combinations of columns, girders and slabs for all loadings from 100 to 500 lbs. per sq. ft., with reference therein to the various members specifically detailed in the preceding tables. The next table has similar, but less complete, data on girderless floor construction. After all these tables, which are published with little regard, on their respective pages, to the methods of their computation or use, come some 25 pages of explanation. This explanation is somewhat limited and incomplete. The author falls into the very common habit of engineers of entirely disregarding the rules of clear writing. Doubtless he understands thoroughly the reasons for his methods, but neither the reasons or the methods are presented in a manner which can be easily understood without a very good knowledge of reinforced concrete and a very close attention to the text.

The next 35 pages are given over to a description of the "Detailed Design and Computation of Cost of a Reinforced-Concrete Skeleton Building," with accompanying tables by means of which such computation may be reduced to a minimum. With this there is included a complete tabular discussion of the cost and design of forms, one of the best portions of the book.

The remainder of the book is devoted to short articles on retaining walls, tanks, domes, grain elevators, dams, water pipes, sewers, piles, arch bridges, girder bridges, framed structures, chimneys, and trolley and transmission poles, all of reinforced concrete, and a short discussion of the cost of labor. This latter part represents the note-book evidence of years of experience and computation; it is the stock-in-trade of the contracting engineer reduced to its lowest terms.

As such, it is conceivable that the data may be of value to other contracting engineers who have not had the time or the opportunity to compile such material for themselves, but it must be observed that the portion that will be most valuable will be that devoted to the purely mathematical or statistical. For instance, all tabular statements of weight, cubical contents or any other dimensional quantities are merely matters of mathematical routine; any engineer is willing to accept their computation from any other reputable engineer. When it comes to the dimensioning of concrete arches, dams, chimneys, etc., where the elements of location, construction, etc., to say nothing of indeterminate mathematical assumptions, enter, the engineer prefers his own computations to those of any other man, no matter how reliable the latter may be.

For that reason we think that the latter part of Mr. Mensch's book will not be widely used except by the ignorant or the lazy. As an example: there is given there a large number of tables for the design of reinforced-concrete arches, preceded by a categorical description of the method of computation, backed up by no reasons or proof. In these tables, the dimensions and stresses are given for arches varying in span up to 500 ft. Leaving aside the very apparent absurdity of setting down in three or four lines the design of a 500-ft reinforced-concrete arch, or even of a 100-ft. arch for that matter, we cannot see that anyone who assumes the competency to design an arch of any size has much to gain from the note-book items of another man. He certainly would want to go through the computations himself before trusting his reputation to the bridge.

Therefore, for those portions of the book which contain the results of routine computation and for the really useful material on estimating and on formwork, we have the greatest commendation. The portion which assumes to give short cuts to what must of necessity be the result of either long experience or tedious computation, we think is dangerous matter to put in the hands of the inexperienced. A contractor, unacquainted with the elements of concrete construction, may assume that by taking an assorted lot of figures from various tables and putting them together like a picture puzzle, a safe design—on the authority of an acknowledged expert—will result. In such a contingency Mr. Mensch may be indirectly responsible for a number of failures of structures the design of which he would never approve. However, as we note on the rear of the title-page that the price of the book is $10, it is probable that this indirect responsibility will not be very extensive.

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MAIN DRAINAGE OF LONDON.—Descriptive Account, with Four Accompanying Plans, by Maurice Fitzmaurice, M. Inst. C. E., Chief Engineer of the [London County] Council, May, 1909. (Presented to the Main Drainage Committee of the London County Council.) London, England: P. S. King & Son. Paper; 8¼ × 13 ins.; pp. 18; four folding plates. 1s. 6d.; American price, 60 cts.

The history and general character of main intercepting sewers and the sewage treatment works for the 5,000,000 people comprised within the Administrative County of London are satisfactorily described, space considered, in this pamphlet. Extracts are given from a number of reports by commissions and by engineers, all dealing with the problems which have been raised from time to time in connection with the main sewerage system of London.

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A Simplified Exposition of Alternating Currents.

THE PRINCIPLES OF ALTERNATING CURRENTS.—For Students of Electrical Engineering. By Edgar T. Larner, Assoc. Inst. E. E., of the Engineering Department, G. P. O., London. New York: D. Van Nostrand Co. London, England: Crosby Lockwood & Son. Cloth; 4¾ × 7½ ins.; pp. 136; 72 figures in the text. $1.50, net.

The author of this little text has stated his aim as a clear presentation of the first principles underlying alternating current phenomena, to students who have not had technical or mathematical training. Some familiarity with mechanical things is presupposed, and to study the book intelligently some elementary knowledge of electricity and magnetism is necessary. About where the author expects a reader to be able to start is shown by his opening paragraph:

> In the year 1831 Michael Faraday discovered that when the number of magnetic lines of force passing through a circuit are (*sic*) increased or decreased a current is induced in that circuit.

After stating the first laws of electro-magnetic induction, as deduced from Faraday's work, the author outlines the electrical units in electro-magnetic terms with the absolute and the practical values of the units compared. Mechanical analogies follow, such as those between force and voltage, velocity and current, friction and resistance, between inertia and inductance, elasticity and capacity, etc. This section closes with a dozen problems giving concrete application of the units. The use of mechanical analogies and problems is continued throughout the book. The analogies are well stated and should be of help to students of the type for which the author writes.

In developing the application of "Ohm's law for alternating currents," the effect of inductance, capacity and resistance on continuous currents are first taken into account and comparisons are made of the behavior of similar circuits under direct and alternating current.

Another chapter defines and illustrates harmonic motion, vector quantities and allied ideas as introductory to the explanation of waves of current, voltage, etc. Later, the author takes up the properties of circuits with resistance, inductance and capacity, in parallel and in series. At the close of the book the concept of power in alternating-current circuits is developed from the analogy of the instantaneous and mean mechanical power in a body having a harmonic motion.

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THE WESTINGHOUSE E-T AIR BRAKE INSTRUCTION POCKET BOOK.—By W. W. Wood, Air Brake Instructor, Author of "The Walschaert Locomotive Valve Gear," etc. New York: The Norman W. Henley Publishing Co. Cloth; 4¾ × 7 ins.; pp. 242; 48 illustrations, partly in the text. $2.

This book is a detailed instruction book for use with the latest form of improved "E-T" locomotive brake equipment made by the Westinghouse Co. The changes in brake practice due to the high speeds and heavy trains which have come into vogue during the past dozen years have been so great that an up-to-date instruction book for the use of trainmen cannot fail to be advantageous. In preparing this book, great pains have been taken, by the use of diagrams printed in various colors, to illustrate the action of the brake and make it clear to the student. The book is well printed, but a binding which would be less easily injured by exposure to water and oil and the wear of the trainman's pocket would have been better than the one used.

◆

PROGRESS REPORTS OF EXPERIMENTS IN DUST PREVENTION, ROAD PRESERVATION, AND ROAD CONSTRUCTION.—Circular No. 90, Office of Public Roads; Logan Waller Page, Director. Washington, D. C.: Pub. Doc. Paper; 5¾ × 9 ins.; pp. 23.

By way of continuation of descriptions of early experiments (Circulars Nos. 47 and 89) there are here presented accounts of experiments with asphaltic preparations, tar preparations and residual oil, made at Newton, Mass., in 1908; an experiment with earth asphalt at Independence, Kans.; experiments with tar-slag, tarred slag and tarred slag-limestone macadam at Birmingham, Ala.; and descriptions of four experimental sand-clay roads in Kansas. Brief reports are also given on various experiments of earlier years.

The value of the circular would be much greater if it contained more in the way of conclusions as to the results, satisfactory or otherwise, of the various materials studied, and finally some general comparisons. As the circular now stands, a large portion of it is taken up with brief descriptions of the material used and how it was applied, and no indication whatever as to how it acted under use. The attempts made to give unit-cost figures are commendable.

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Federal and State Collections of Uniform Municipal Statistics.

STATISTICS OF CITIES HAVING A POPULATION OF OVER 30,000: 1906.—Special Reports, Bureau of the Census; S. N. D. North, Director. Washington, D. C.: Pub. Doc. Paper; 9 × 11½ ins.; pp. 350.

COMPARATIVE FINANCIAL STATISTICS OF THE CITIES AND TOWNS OF MASSACHUSETTS.—Covering Municipal Fiscal Years Ending between Nov. 30, 1906, and April 1, 1907. By the Chief of the Bureau of Statistics of Labor (Charles F. Gettemy). Boston, Mass.: Pub. Doc. (No. 79). Paper; 5¾ × 9 ins.; pp. liii. + 299.

MUNICIPAL ACCOUNTS.—Abstracts from Report of the State Comptroller. (Charles H. Gaus, Comptroller.) Albany, N. Y.: Pub. Doc. Paper 5½ × 8½ ins. pp. 309.

COMPARATIVE STATISTICS OF CITIES OF OHIO, 1907.—Department of Auditor of State. Bureau of Inspection and Supervision of Public Offices, Columbus, Ohio, June 15, 1908. Columbus, Ohio: Pub. Doc. Paper; 6½ × 9¼ ins.; pp. 212.

STATISTICS OF CITIES AND TOWNS OF IOWA, 1907. —First Annual Report. Department of Finance and Municipal Accounts. (B. F. Carroll, Auditor of State.) Des Moines, Iowa: Pub. Doc. Cloth; 8¾ × 12 ins.; pp. 133.

MUNICIPAL STATISTICS (Ontario).—Municipal Bulletin No. 2, Bureau of Industries. Toronto, Ont.: Pub. Doc. Paper; 5½ × 8¾ ins.; pp. 36.

Thanks to the National Municipal League, the Congress of the United States acting through the Bureau of the Census, and a number of state legislatures acting through various administrative departments, there is now being brought together, year by year, an increasingly large and valuable collection of municipal statistics. Following more or less closely the classification of the National Municipal League, these municipal statistics are sufficiently uniform to afford what has been needed but lacking for so long a time; that is, means for comparing some of the many activities of our cities. Most of the figures collected by the national and state governments are of a financial character.

Of the collections of municipal statistics now under consideration, those brought together by the Bureau of the Census relate to the 158 cities which were estimated to have had a population of 30,000 or over in 1906; the Massachusetts report deals with the 33 cities and 321 towns of the state; the New York report appears to give figures for 56 of the 57 counties, 39 of the 42 cities of the second and third class and 423 of the 438 villages of the state; the report for Ohio is confined to the 70 cities of that commonwealth; the Iowa report gives figures for 91 of the 96 cities of the state, and 676 of its 701 incorporated towns. Altogether the various reports deal with municipalities or other minor civil divisions having populations ranging from the millions of New York City to considerably less than 100 in both Massachusetts and Iowa. The report for Ontario, not mentioned before, also deals with places having a wide range of population.

With the exception of New York and Ohio, there appears to be nothing behind any of these reports, except moral suasion and dictates of convenience, to compel or lead the various municipalities involved to adopt uniform accounting systems. An Ohio law, enacted a half-dozen years ago, provided for uniform accounting in all the cities and villages of the state, under the jurisdiction of a state department. The New York law which requires the return of financial statistics to the state comptroller, we learn from the Census bulletin before us, authorizes the comptroller to formulate and prescribe uniform accounts, and directs him to inspect the accounts, but the report here considered does not state whether either has been done. The presentation of elaborate schedules year by year to the various cities of the United States of 30,000 and upwards, and to the municipalities of the states already named, will show, in a large percentage of those municipalities, the inadequacy of their accounting systems both as to completeness and comparability of the figures to which they give rise, with those of other cities. By this means there will be a continual and increasing tendency for the various municipalities to adopt, if not a uniform system of accounts, at least a system so devised as to make it thoroughly feasible to draw from the municipal account books figures which can be brought into line with uniform schedules.

The classification of accounting statistics followed in the Census, the Massachusetts, Iowa and Ohio reports, is based on the schedule formulated some years ago by the National Municipal League, as is also partly the case as regards the New York report. This was modified by both the Census and the Ohio officials in a variety of particulars, the changes having been introduced partly as a result of experience drawn from actual working and partly to conform to the division into municipal departments adopted in the recent remodeling of the municipal code of Ohio. The Massachusetts scheme of classification is patterned directly after the Census modification of the National Municipal League scheme, but includes some modifications designed to suit local requirements or opinions. The New York report conforms to the League schedule far less than do those of the other states. The Iowa report contains no direct statement as to the principles followed in making up the classification used, but the internal evidence indicates that it also is modeled on the Census schedules.

The Census, Massachusetts, New York and Ontario reports are confined almost wholly to financial statistics. The Ohio and Iowa reports (the latter for cities, only) give the salaries and wages paid to incumbents of various offices and positions. In addition, the Ohio report gives the miles of paved streets and sewers, and the Iowa report gives a few physical statistics for electric and street lighting, water-works, paving, sewers, "cement" sidewalks, and parks, together with unit costs of lighting and water-supply—the unit costs being given separately for municipal and private ownership. It should be noted that the Census report gives a few physical statistics for water-works. The Iowa report gives considerably more information for cities than for towns, and the Massachusetts report contains summaries for the cities which are not included for the towns. Like summaries for towns as well as cities, it is expected, will be included in later issues of the Massachusetts report. They were omitted in the first report, owing to the fact that after the work of compilation was well in hand a change in administration of the department in charge resulted in a change of plan to bring the classification into line with that followed by the Census. It was not considered advisable to attempt a reclassification for the towns.

The most highly elaborated accounting classification is to be found in the Census report, and next to this comes the classification of the Ohio report. The present Census report goes beyond the others in attempting to present a reasonably complete exhibit of the movement of all funds handled by each city, both as a whole and by departments. This requires a mass of detail that will never be followed except by fiscal and accounting officers, but will doubtless prove of great value to them and indirectly of value to all who have to do with municipal statistics.

The text of the Census report is also much more extensive than that of the others. In fact, the Ohio report has no text, there is very little in the New York report, and that of the Iowa report is confined chiefly to an explanation of the tables, with a few summaries or other salient facts drawn from the detailed tables. The text of the Massachusetts report outlines the movement and reasons for uniform municipal statistics and discusses in some detail the statistics presented.

The text of the Census report consists first of an introduction of some 50 pages. This includes a discussion of accounting terminology, a comparison of private and government business accounting, a review of the movement for uniform municipal accounting reports, and a description of each of the 35 general tables given in the report. Accompanying this description are a number of tables presenting for the most part details which could not be included in the general tables.

We have already made it clear that the general classification of the Census and three of the American state reports is based on the work of the National Municipal League, while the fourth report follows it in some respects. Much of this classification has a functional basis. This functional basis for the Census falls into nine divisions: (1) General government; (2) protection of life and property; (3) health conservation and sanitation; (4) highways; (5) charities and correction; (6) education; (7) recreation; (8) municipal industries; (9) miscellaneous. The Massachusetts report departs from this classification chiefly in taking libraries and reading-rooms from "Education" and making it a separate class, and in putting all miscellaneous expenditures under the head of "General government." The Ohio functional classification is grouped, so far as totals are concerned, under four heads: (1) General government; (2) protection of life, health and property; (3) public services; (4) public education. These classifications are subdivided with sufficient minuteness so that it would probably be possible for any one who might desire to do so to rearrange and total the items under the same grouping as is followed by the Census and Massachusetts reports. Municipal public-service industries, in the Ohio report, are included under the general heading "Public service," which, besides the revenue-producing industries, includes streets, sewers and a variety of other undertakings. The grouping indicated for Ohio has been adopted, presumably to accord with the general division of municipal government in Ohio municipal departments.

The Iowa functional classification differs from that of the Census chiefly in omitting "Charities and correction" and "Education." In place of "Education" the entry "Libraries" occurs.

The figures in the New York report are presented by departments rather than functions, but in such detail that many of them might be regrouped by functions. The plan followed makes the New York report more strictly local or provincial than those of the other states. It is hoped that subsequent reports will be brought into line with the general scheme.

Each of the reports may now be considered separately. The first of the 35 tables in the Census report gives the date of incorporation, the population, and the land and water areas of each of the 158 cities included in the report. Most of the other tables are summaries of accounting figures, classified under a variety of heads. There are also classified figures of indebtedness, assessed valuation, and the percentage of assessed to actual values. An interesting feature of the report is a statement of the valuation of the property owned by the city, both productive and unproductive. Separate tables are devoted to receipts from public-service enterprises, classified in considerable detail. Per capita figures are given in a number of the Census tables, such as indebtedness, payments and receipts, by classes, and the percentage distribution of payments for various municipal services.

In a table devoted to municipal water-supplies, a few physical as well as financial statistics a[illegible] given and an attempt is made to introduce, by means of estimates, a number of items necessary to determine the true income of the various water-supply systems. These items include allowances for depreciation, lost taxes, and interest on the present value of the works. In order to make the computation of the last item possible, a column of present values is included.

Of two appendixes to the Census report, one gives receipts from public-service companies in some detail, and the other is devoted to uniform accounts and reports of water-supply systems. In the latter, Mr. Powers presents a detailed scheme for water-works accounting, accompanied by explanatory text and descriptive terminology. In addition, there is included in this appendix a brief historical review of previous attempts to secure uniform water-works statistics and a detailed schedule for presenting physical data of water-supply systems on a uniform basis, both prepared by Mr. M. N. Baker, of the editorial staff of this journal. The aim of the schedule for uniform physical data was to secure a classification which would exhibit the various parts of a water-supply system in logical order, so as to make more readily comparable than has heretofore been possible the operations and costs of different works. To this end, after certain general statistics relating to the municipality concerned, water in place, as it might be termed, is considered; that is, water-supply regardless of character, elevation above or below, and distance from the center of distribution or city. Storage, purification, pumping and distribution are separately considered.

The Census bulletin as a whole presents gratifying evidence of the advance being made in improved municipal accounting in general, and in greater uniformity, and thus comparability, of municipal statistics in particular.

The detailed tables of the Massachusetts report are fewer and in some respects simpler than those given in the Census bulletin. The way some of the detailed figures are put, combined with the summary of tables for cities, renders the Massachusetts report more immediately useful for local studies and general comparisons than is the Census report. In addition, lines of study and comparison are suggested by the text. Both the Ohio and the Iowa reports go further than do either the Census or Massachusetts reports in the matter of detailed classification of some of the expense items, particularly those relating to salaries and other departmental expenses.

The range of statistics in the Ontario report is comparatively narrow. Apparently the report is a preliminary one, to be followed by more detailed figures. Statistics of "assessed" populations and areas, total assessments and assessments for school purposes, together with taxes levied, debt and sinking funds for the year 1907, are given for townships, towns and villages in one table. In a second table, receipts, disbursements, assets and liabilities are given for counties, townships, towns and villages for the year 1906. A third table gives a summary for Ontario of assessments and taxation for each of the years from 1898 to 1907.

Considering again this collection of reports as a whole, it is to be noted that for the most part they stop short with the presentation of statistics for each of the several cities. Where more than this is attempted, it is generally by way of summary, only. Interpretation or application of the statistics is left almost wholly to the individual student of the reports. The Massachusetts report goes further than any of the others in attempting to bring the vast mass of figures into some sort of relation with the actual municipal problems of the day, but for the most part all it can do, owing to various limitations, is to raise a number of questions as to why there should be such great diversity between unit figures in different cities.

These diversities, it points out, cannot be explained by differences in gross area or population, nor by taking density of population into account. These questions, without satisfactory answers, suggest to us, as we think they will to many others who attempt to study them from the point of view of utility, that in order to make the financial figures of greatest possible usefulness they should be accompanied with physical and other collateral data. The mere totals of receipts, expenditures and indebtedness for this and that city and for groups of cities are of but little service to any one except as showing general tendencies. The percentage distribution of expenses by departments of municipal governments, shown in the Census and Massachusetts reports, are suggestive, as are the per capita figures of various kinds in the same reports. But before the wide variations shown in both per cent and per capita figures can be explained, much information is required as to the comparative services rendered in each city. This demands physical as well as financial data. With each class of data in hand, both the amount of service and unit costs would be available, and thus comparison city by city would show something besides wide divergences for the same class of service.

Here a twofold difficulty is encountered: (1) physical statistics of cities are more scanty and perhaps less comparable to-day than financial; and (2) most of the financial statistics available do not exhibit full and true costs of municipal services. This deficiency in financial statistics, notwithstanding the gratifying progress of the past few years, raises a question whether for the present efforts should be concentrated on improving financial statistics, leaving physical statistics for later attack, or whether both lines of attack should be carried on together. For our part, we incline strongly to the double line of attack, and all the more so because the physical statistics are in the hands of quite a different set of men from the financial. So if only census and state bureaus could find the time and men (really the money) to take up physical statistics, both lines of attack could be made at once.

The Bureau of the Census is devoting itself earnestly to perfecting its financial statistics, both through improving the form of its schedules and through its exhaustive discussion of the principles and terminology of municipal accounting. It is only fair to note that the Census is not confining itself wholly to financial statistics, but is all the time at work on one or more lines of physical statistics—such, for instance, as the detailed water-works schedule already noted.

MORTALITY STATISTICS, 1907.—Eighth Annual Report, Bureau of the Census; S. N. D. North, Director. Washington, D. C.: Pub. Doc. Cloth; 9 x 11¾ ins.; pp. 538; diagrams.

These statistics cover the registration area of the United States, which was the same for 1907 as for 1906. Director North, in his letter of transmittal, notes with pleasure that Washington and Wisconsin will be included in the registration area statistics for 1908, thus bringing the estimated population in the registration area up to 51.6% of the total population of Continental United States. In actual figures, the increase has been from about 29,000,000 in 1900 to about 45,000,000 in 1908. The hope is expressed that other states will soon be added to the registration area.

The introductory text reviews the progress of legislation for vital statistics in the United States, including the cooperation of various associations. The standardization of vital statistics is discussed, and the names of a number of cooperating association committees are given. The introduction then proceeds to a summary of the results of the vital-statistics inquiry for 1907. Summary tables for causes of death by general classifications, and also by specific infectious diseases, are given. Taking typhoid fever as an illustration of the summaries of deaths from specific diseases, we may note that the annual average for the five years 1901-05, and also the yearly figures for each year from 1903 to 1907, inclusive, are given. These figures are presented for the registration area, for registration cities, for registration states, and for the rural part of registration states, all in the way of averages for the whole areas and groupings considered. In addition, the same range of figures is given for registration states and for registration cities which by the census of 1900 had populations of 100,000 and over. Typhoid figures for the five years named are also given for a considerable number of cities of less than 100,000 population.

Most of the space in the volume is given up to detailed tables. Of two appendixes, one deals with "Rules of Statistical Practice" and "Medical Education in Vital Statistics," and the other takes up in detail "Tuberculosis in the United States."

WISCONSIN RAILROAD COMMISSION.—Second Annual Report, from June 30, 1907, to June 30, 1908. (J. M. Winterbotham, Secretary.) Cloth; 5¾ x 9 ins.; pp. 1,229; one folding sheet.

The latest report of the Wisconsin Railroad Commission is particularly interesting, in view of the fact that it covers the work of the Commission since the various municipal public utilities were put in its charge. These include water, gas, electric lighting, heating and telephone companies, for all of which the rates in force at the time of the report, together with a mass of financial, operating and other statistics, are given in this volume. Steam and electric railways are also covered in a comprehensive manner by the report. The introduction to the report contains a very interesting discussion of the new public utilities law and the experience of the Railroad Commission in operating under it. The Commission's attempts to frame a schedule for making up uniform reports of the various public utilities, and the difficulties encountered both in making up the schedules and in securing the returns, form not the least interesting part of the report. The statistical and other matter relating to municipal public-service industries, both privately and publicly owned, make up not only the first but by far the more comprehensive collection of information of this sort which has ever been brought together by a single state. Wisconsin has done good pioneer work in placing virtually the whole of its public-service industries under public control, and requiring each and all of them to give an accounting to the public, from which they derive their power both to do business and, in the case of private companies, to gain profit from the people.

SEWAGE PURIFICATION AND DISPOSAL.—By J. J. Cosgrove, Author of "Principles and Practice of Plumbing," etc. Pittsburg, Pa.: Standard Sanitary Mfg. Co. Cloth; 5½ x 8½ ins.; pp. 222; 71 illustrations in the text, and 24 tables. $3.

Considering his limitations of space and evident lack of professional experience as a sewage-works engineer, Mr. Cosgrove has covered about the whole field of sewage treatment in a remarkably satisfactory manner. Here and there appear evidences, both in statements and in spelling, which indicate unfamiliarity with the subject before entering upon the preparation of the book. This inference is based wholly upon internal evidence of the book itself, and may not be at all in accordance with the facts. If, as we surmise, the work is chiefly or wholly one of compilation, the author certainly deserves credit for the results which he has achieved.

Most of the illustrations are highly commendable. They are well chosen and well presented, and, generally speaking, will give even a novice a clear understanding of the devices they are intended to present. All the illustrations are line drawings or pen-and-ink sketches, made specially for this book.

After taking up the composition and decomposition of sewage, the various methods of treatment now in vogue are each passed in brief review. There are short chapters on sewage-pumping plants and on designing purification works. The latter deals principally with the quantity of sewage to be provided for, population estimates, and the choice of a method of treatment. In an appendix the author reprints Mr. Allen Hazen's discussion of many years ago, on "Some Physical Properties of Sands and Gravels with Special Reference to Their Use in Filtration." The author puts Mr. Hazen down, as he was at the time the discussion was written, as "Chemist in charge of Lawrence Experiment Station," and fails to indicate when the discussion was prepared and where it first appeared.

THE SANITATION, WATER SUPPLY AND SEWAGE DISPOSAL OF COUNTRY HOUSES.—By Wm. Paul Gerhard. New York: D. Van Nostrand Co. Cloth; 5 x 7¾ ins.; pp. 328; 1 folding plate and 113 text illustrations. $2, net.

Mr. Gerhard has added another volume to his already long list of books on some of the minor branches of sanitary engineering. The present volume covers in a comprehensive manner the subjects indicated by the title. The first of the three sections into which the book is divided takes up the general subject of country-house sanitation. It goes somewhat into matters of water-supply and sewage disposal, but, except for some of the elements of these subjects applicable more particularly to small houses, it leaves these two topics to be taken up in more detail, each in a separate section of the book. The treatment throughout is on the whole quite satisfactory, although considerable condensation could probably have been effected to advantage. The book contains little or nothing on plumbing; instead, the author refers at every point to some of his other writings. This is perhaps excusable, although doubtless many purchasers will be annoyed by repeated invitations to buy another book when they may have supposed that this one covered everything indicated by the title.

To many, probably the most valuable feature of the book will be its illustrated examples of water-supply and sewage-disposal systems. These are largely, though not wholly, drawn from the professional work of the author, but are not thrust forward in a way that is particularly suggestive of personal advertising.

Trusses Without Diagonals.

Reviewed by LEON S. MOISSEIFF,* M. Am. Soc. C. E.

TRUSSES WITHOUT DIAGONALS [In Russian].—Their Calculation and Use in Iron and Reinforced-Concrete Construction. (Bridges, Roofs and Girders.) By John Podolsky. Moscow, Russia: The Author. Paper; 6¾ × 10 ins.; pp. 270; 140 illustrations in the text. 3 roubles; American price $3.00.

Three years ago the writer reviewed in these columns Mr. John Podolsky's book on Reinforced-Concrete Bridges and Viaducts. The favorable impression then received was enhanced subsequently when the writer had the opportunity to refer to the book in the course of his professional work. It was therefore found with much pleasure that the present volume was, in clearness of exposition and fulness of detail, equal to the author's previous work. Clearness is here especially important because the present book treats of a subject which has not received much discussion and needs by the nature of the problem a clear exposition.

Trusses without diagonals are not based on triangles, as are the usual truss systems, but on quadrangles or a combination of quadrangles and triangles. The resistance to change of form of the usual truss systems is furnished by the basic triangles of which each truss is composed. The change of length of the members of the truss determine its deformation. No reliance is placed on the rigidity of the joints and they are, moreover, assumed to be freely movable. The rigidity of the trusses without diagonals is, on the contrary, dependent on the stiffness of the joints connecting the various members of the quadrangles. It is obvious that the computation of the stresses in trusses without diagonals is not as simple as that of statically determinate trusses, with assumed frictionless hinges.

Prof. A. Vierendeel, of Belgium, was the first to make extensive and detailed studies of trusses without diagonals. In 1897, he built, in Brussels, at the time of the International Exhibition, a bridge of 103-ft. span, which was tested to destruction. The results of this test were subsequently published in the "Annales des travaux publics de Belgique" and show the great rigidity of the trusses and small effect of dynamic loads. Prof. Vierendeel at that time also submitted a paper on the theory of trusses without diagonals, which, however, was complicated and not readily applicable. Subsequently, he and several other engineers developed a shorter method of computation, based on one or another simplifying assumptions.

These attempts do not, however, satisfy the author and he develops, in some 120 pages, his own approximate theory. In this he considers a truss without diagonals as a solid beam with rectangular openings cut through it. He determines first the primary stresses in the members and adds to them the secondary stresses due to the vertical and longitudinal shearing forces. So that the formula for the stress in any member consists of two parts which are similar in form to the formula for a column eccentrically loaded.

The author handles the subject very well. He discusses the effects of movable loads and the deformation of the individual members of the truss, and shows how to compute the deflection of a truss without diagonals. A comparison is then made of the results obtained by the several theories proposed for the computation of the trusses, and it must be admitted that the author's theory gives closely approximate results without much labor.

Part II. of the book treats of the use made of trusses without diagonals for iron and steel structures. The author describes in detail the first bridge built by Prof. Vierendeel in Brussels, the tests it was subjected to and the mode of its failure. Several other bridges built according to the same principle are also described.

In Part III. the author deals with reinforced-concrete bridges of the Vierendeel type. Descriptions and illustrations are given of many reinforced-concrete bridges which were built with open webs, but without diagonals. It seems that such bridges lend themselves readily to this type of truss. Obviously, the elimination of diagonals in concrete trusses affords a great convenience to the builder. Some 50 pages are devoted to the discussion of the design of reinforced-concrete trusses without diagonals. This section is illustrated by a numerical example of a given girder.

It is doubtful whether any actual economy could be realized, as the author believes, in steel trusses without diagonals as compared with those with diagonals. The total cost is governed by other items besides the amount of steel used. The field for steel trusses of this type is apparently a limited one. Nevertheless, engineers will find that in quite a few instances its application would afford an excellent solution for many difficulties.

Glancing at the illustrations of such bridges, as given in the present volume, it must be admitted that trusses without diagonals look well. For highway bridges, say up to 250-ft. span, built for moderate moving loads, such trusses would prove attractive if built as through bridges. Another use for trusses without diagonals suggests itself for girders in building over large halls or stores. The elimination of diagonals would, in this case, allow of the most convenient utilization of the space above the hall.

The author has succeeded in producing a book which covers the subject fully, is easily followed and treats of matters in a practical manner. It is to be regretted that so few American engineers can avail themselves of it.

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*Park Row Building, New York.

Municipal Socialism in England.

SOCIALISM IN LOCAL GOVERNMENT.—By W. G. Towler, Secretary of the London Municipal Society. With Introduction by Captain H. M. Jessel. Second Edition. New York: The Macmillan Co. Cloth; 5 × 7½ ins.; pp. 336. $1.50, net.

So much alarm has been caused in various quarters in England of late, by the progress of what is there known as municipal trading, that a number of books have been written designed to expose the fallacies and follies of municipal ownership. Some of the authors have broadened their animadversions so as to make out as strong a case as possible against socialism. Among the latter is the author of the book before us. He has for fifteen years past been connected with and is now secretary of the London Municipal Society, which was organized specifically to combat socialistic tendencies in general and those of the London County Council in particular.

The larger part of the present book goes over very much the same ground that has been covered by other recent British authors who have written against municipal ownership, but in addition Mr. Towler connects the municipal-ownership or trade movement in England very directly with socialism. This he does throughout the book, and particularly in the first two chapters, which are entitled "The Aim of Administrative Socialism" and "The New Heptarchy." After setting up his case from this point of view, the author next deals with the history and extent of municipal trading, the opposition of its advocates and supporters to exhaustive inquiries into its status, merits and demerits, the general financial aspects of municipal trading, and the price and quality of the service given by municipalities which have embarked upon municipal ownership. He then compares public and private enterprise, draws some discouraging lessons from state enterprises in Great Britain, particularly in the military and post-office departments, and sets forth what he considers to be the deplorable effects of socialistic enterprises upon national character and progress. Monopoly under municipal ownership, labor and politics, municipal housing and municipal works departments are each and all ably handled from the author's point of view. Advocates of the direct employment of labor in place of the contract system of executing public works in this country would do well to read Mr. Towler's chapter on "Municipal Works Departments." Even if they did not agree with his conclusions, they could scarcely fail to see that the statements he makes contain warnings of things to be avoided, which should be heeded in this country as well as in Great Britain.

A distinctive feature of Mr. Towler's book is its presentation of an alternative to municipal ownership; namely, well-considered measures of state control of public-service enterprises, entrusted in all cases to private rather than municipal endeavor.

Two chapters deal with socialism in education and in the "Poor Law" (Charities) respectively, and another one takes up the "Municipalization of the 'Drink Traffic.'". These three chapters, as well as a very interesting and valuable one on "The Right to Work," seem to be less partisan than those in which the author discusses the various phases of municipal ownership. He recognizes here more fully than he does in most other parts of the book that there are really two sides to every question. In the course of this chapter, Mr. Towler brings in with telling effect some quotations from speeches made by Mr. John Burns, President of the Local Government Board, against the Unemployed Workmen bills which have been before but have been defeated by Parliament for several years past. The author also presents a very interesting and effective epitome of experiences with national workshops established in France about the middle of the 19th century.

As we have already intimated, this book, like practically all others on either side of the municipal-ownership question, restricts its evidence and argument almost wholly to one side of the case. This may make for winning converts and strengthening those already on a given author's side, but obviously it does not make for truth and for quick and satisfactory solution of the many pressing problems which are bound up with the question of the relative advantages of public and private ownership and which attach to the still broader question of socialism. The book is readable, and, barring the limits of partisanship, may be commended to students of the subject which it treats. It does not present much that is new in the more limited field of municipal ownership, but in the broader field of what the author terms municipal socialism a considerable amount of matter which is at least new on this side of the water is brought forward in an able and interesting form.

A commendable feature of the book, which might with very great advantage to author and reader be adopted by many writers who seem never to think of such a thing, is the summing up of the argument at the end of each chapter, and finally summing up the whole volume in a series of conclusions.

THE BUILDING FOREMAN'S POCKET BOOK AND READY REFERENCE.—By H. G. Richey, Superintendent of Construction, U. S. Public Buildings. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Flexible leather; 4¼ × 7 ins.; pp. 1,118; 656 illustrations in the text, and numerous tables, $5.

In previous issues we have reviewed the consistently meritorious hand-books that Mr. Richey has written in the past few years. These books have been for the special use of the various trades, for plumbers, carpenters, and woodworkers, stone and brick masons, cement workers and plasterers, and superintendents of construction, builders and building inspectors. This latest volume covers all of these subjects in the general manner that the building foreman may require. Since it does cover more ground than do the others, it is of larger size and necessarily repeats much that may be found in the more specific editions. It is, however, very complete and detailed without being unreasonably verbose.

A Book on Mining Engineering.

Reviewed by G. MONTAGUE BUTLER.*

PRINCIPLES OF MINING.—Valuation, Organization and Administration. Copper, Gold, Lead, Silver, Tin and Zinc. By Herbert C. Hoover, M. Am. Inst. M. E. New York and London: Hill Publishing Co. Cloth; 6 x 9½ ins.; pp. 199; 45 illustrations in the text. $2.50, net.

In this condensation of a series of lectures delivered in part at Stanford and in part at Columbia University, the author, as he says, addresses himself neither to those wholly ignorant of mining, nor yet to those long experienced in the profession. The work is, consequently, not a text-book covering the details and rudiments of ore extraction, but is an admirable discussion of the broader phases of the subject from the advanced standpoint of the examining or managing engineer.

The author's long and unusually varied experience in connection with important mining operations gives his statements, opinions, and advice the stamp of authority, and enables him to compare methods and arrive at conclusions which, if accepted by the inexperienced, will obviate the necessity of much extensive and costly experimentation. In cases where several modes of procedure are possible, the favorable and unfavorable aspects of each are presented impartially and with ample detail, thus greatly simplifying the selection of a plan of operation for a given combination of circumstances. These features make the book peculiarly useful to the young engineer examining or managing his first mine, for many of the problems discussed are certain to confront him, and he must often feel the need of sound, trustworthy advice, such as this work affords. The volume should be even more welcome to those "practical miners" who have succeeded in advancing to positions of responsibility although handicapped by the lack of a technical education.

The first six chapters are devoted to a very practical presentation of the subject of mine valuation, in which the author not only includes directions for determining the average metal content and quantity of the ore, but also discusses, among other topics, the classification of ore in sight; extension in depth; origin and structural characters of deposits; percentage of the gross assay value which is recoverable; reports; and the principles governing secondary enrichment, fluctuations in the price of metals, amortization of capital and interest, and the valuation of mines on second-hand data. There is apparent here, as well as throughout the work, a commendable readiness and ability to quote definite figures. This is well exemplified in the following from page 19:

> In a general way, a fair rule (in order that ore may be called "proved") in gold quartz veins below influence of secondary alteration is that no point in the block shall be over *fifty feet* from the points sampled.

It is to be regretted that so few engineers appear willing to contribute much needed data of a similar nature.

The chapters on Stoping, Methods of Supporting Excavation, Mechanical Equipment, Determination of Most Desirable Output, and Administration embody an extraordinary amount of unusually valuable and suggestive material in a much condensed form. Indeed, the only apparent fault of the work is that it is too condensed; whole lectures have been packed into single paragraphs so filled with conclusions and suggestions as to make it somewhat difficult to extract their full meaning.

The book closes with a short chapter on the Amount of Risk in Mining Investment, and another on the Character, Training, and Obligations of the Mining Engineering Profession. The latter deserves the careful consideration of all mining engineers, who will find the entire book well worth reading and a decided contribution to the rather limited literature of their profession.

◆

The life history of Richard B. Osborne, formerly Chief Engineer of the Philadelphia & Reading R. R., who died Nov. 28, 1899, has been reprinted in pamphlet form from "Philadelphia & Reading Railway Men." Copies of this pamphlet may be obtained by addressing Mr. Percy T. Osborne, 933 Spruce St., Philadelphia, Pa.

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*Mining Engineer; Assistant Professor of Geology and Mineralogy, Colorado School of Mines, Golden, Colo.

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By DANIEL W. MEAD, Professor of Civil and Sanitary Engineering, University of Wisconsin

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Structural Steel Design—Descriptive Geometry.

Reviewed by HENRY S. JACOBY,[*] Assoc. Am. Soc. C. E.

DESIGNING AND DETAILING OF SIMPLE STRUCTURES.—By Clyde T. Morris, Assoc. M. Am. Soc. C. E., Professor of Structural Engineering, Ohio State University. Ohio State University Civil Engineering Publications, No. 3. Columbus, O.: The University. Cloth; 6 x 9 ins.; pp. 201; 75 illustrations in the text. $2, net.

DESCRIPTIVE GEOMETRY.—By Gardner C. Anthony, Sc. D., and George F. Ashley. Boston, Mass.: D. C. Heath & Co. Cloth; 7½ x 6 ins.; pp. 130; 34 plates and 195 text figures. $2.

Professor Morris states in the preface that

> the object sought in this book is to collect from the many larger and more exhaustive works on structural steel design, those parts which are applicable to simple structures, and which can be taken up in technical schools in the limited time usually allotted to the subject; and at the same time, to show by general cases and specific examples how the simple laws of statics may be applied to the details of steel structures with the object of producing details which are in accord with the stresses they have to transmit.

The numerous references to Heller's "Stresses in Structures" indicate that it is to be used as a companion volume and therefore no space is devoted to stresses in the book under review. More than one-third of the contents are included in the first three chapters, on riveting, on designing and estimating, and on manufacture and erection. This material on shop methods as applied to any given contract in the designing, drafting and manufacturing departments is well selected and arranged. The eight-page article on shop drawings merits especial commendation for the number of valuable directions and hints based on practical experience which are packed within these limits.

The remaining four chapters deal with a steel roof truss, a deck plate girder and a pin-connected railroad bridge. In each case the designs and details are considered in the order adopted in bridge shops; the computations to determine the sections of members, riveting and other connections, being preceded by a very brief general treatment. With the exception of a double-page shop drawing of the roof truss and three full-page stress sheets, the 75 illustrations consist of selected detail and outline diagrams shown as figures in the text. The illustrations represent good examples of shop drafting, and are reproduced so as to be legible in all cases.

In view of the special attention devoted by engineers to the strength of the lacing during the past year and a half it is worthy of notice that an approximate theoretical formula is deduced for the design of lacing in compression members. It is based on the change in stress in one segment of a column between the average compression at the points of inflection and the points of maximum compression allowed by the specifications. The application of the formula is illustrated on the lacing of the upper chord and posts of the pin-connected truss.

In only one important particular is the theoretic treatment of the design of details observed to be open to adverse criticism. This relates to the riveting of pin plates in compression chords, illustrated in Figs. 13 and 74. In fairness to the author, it must be said that his method of treatment conforms to the average practice. One of the objects of such a book, however, should be to improve the design of structures in features where practice is not entirely satisfactory from the theoretic point of view.

The fundamental principle apparently overlooked is that the riveting in any pin plate should be so arranged that the stress received from its bearing on the pin is transmitted in the most direct manner to the several shapes composing the member. This requires longer pin plates than are often employed, in order to engage sufficient rivets in the top and bottom angles of the upper chord or end post and thereby to avoid overstraining the web plates. There is no necessity then of extending the filler more than a rivet space or so beyond the adjacent pin plate, this being done for the purpose of improving the general appearance or to avoid changing the section area of the member too suddenly. The principle given above is not without experimental foundation. The behavior of pin plates on built-up members was investigated in 1891-93 by a valuable series of full-size tests by T. H. Johnson (Proc. Eng. Soc. Wn. Pa., 1893).

Every young engineer and structural draftsman should add this book to his working library and would profit by its careful study.

Messrs. Anthony and Ashley proceed from definitions and first principles to points, lines and planes; generation and classification of surfaces; tangent planes; intersection of planes with surfaces, and the development of surfaces; intersection of surfaces; warped surfaces; and problems. One of the chapters includes four pages on shades and shadows.

The subject is developed in a logical order and the examples and problems are selected with unusual care. The last chapter contains 7 pages of text and 34 plates of problems so arranged that one series may be taken one year and the other during the following year.

The

> aim of the authors to make a clear and concise statement of the principles involved, together with a brief analysis and enumeration of the steps to be taken, so that the essentials of each problem shall be clearly set forth,

has been carried out with gratifying success. The principal difficulties for the student of descriptive geometry whose imagination has not been developed, manifest themselves at the very beginning of his study. The authors evidently appreciate this fact, for especial care has been taken to state clearly the first principles and to elaborate their relation and illustration by numerous simple examples. In nearly all text-books this part of the treatment is entirely too condensed for effective use.

The third angle of projection is adopted for many of the problems, but a sufficient number of others are given to secure familiarity with the use of projections in any angle. It is a pleasure to note that the modern method of notation is employed. It may be said that in the method of treatment and the selection of examples and problems, the authors have justified themselves in adding another text-book on the subject to the many which are now on the market. No teacher of descriptive geometry should fail to examine this work.

◆

RAILWAY WORKING AND APPLIANCES.—To Which Are Added a Chapter and Diagram on Railway Sketching. By Edward S. Hadley. London, New York and Bombay: Longmans, Green & Co. Cloth; 4¾ x 7¼ ins.; pp. 120; 60 illustrations in the text. 50 cts., net.

This little book is by a lecturer engaged by the Great Western Ry., of England, the railway company having established signaling schools and a system of lectures in order to give its employees (particularly the clerical staff) some knowledge of the rules, methods and appliances in use in the safe operation of railways. About 70 pages are devoted to signaling, interlocking and the block system, and 20 pages to the Westinghouse and vacuum brakes. A short chapter deals with accidents and wrecking, and another describes how freight traffic is handled. One chapter briefly describes a system of "slip coupling," by which a conductor in the rear car of a fast train detaches his car so that it will stop at an intermediate station. We believe that this practice is now used to but a very small extent. Finally, an interesting little chapter discusses railway sketching, or the making of explanatory sketch plans to accompany reports as to proposed alterations, etc. It will be noted that more than half of the book is devoted to signaling, which is some indication of the universal use of such equipment on English railways.

◆

HUMAN AND ANIMAL TUBERCULOSIS.—Third Interim Report of the Royal Commission Appointed to Inquire into the Relations of Human and Animal Tuberculosis. Report and Appendix. (W. H. Power, Chairman.) London, England: Pub. Doc. Paper; 8¼ x 13 ins.; pp. 38.

The communicability of tuberculosis from cows to man has been the subject of much discussion and investigation during the past ten years. The subject has been investigated in considerable detail in behalf of the governments of the United States, Great Britain and Germany, and the representatives of each of these countries are in general agreement that man may be and is infected by tuberculosis through animals, and particularly through the milk of cows. The brief interim report of the British Royal Commission now before us details a number of experiments made in England to determine whether or not the faeces and milk of tuberculous cows contain the germs of tuberculosis. The conclusions of the report are that they do. Similar conclusions have been reached and published by the United States Department of Agriculture.

◆

PRIMARY ELECTIONS.—A Study of the History and Tendencies of Primary Election Legislation. By C. Edward Merriam, Associate Professor of Political Science in the University of Chicago, Author of "A History of American Political Theories." Chicago, Ill.: The University of Chicago Press. Cloth; 5 x 7¾ ins.; pp. 308. $1.35, net; 10 cts. express.

Of the many political reforms being agitated at the present day, perhaps none is of greater importance than the one concerned with elections to national, state and municipal offices. Prof. Merriam here presents a review of primary reforms which have been carried out during the past 40 years. Prior to 1866, primaries for the choice of candidates for various public offices in this country were practically without state regulation of any sort. The earliest legislation was directed chiefly against frauds, and, in so far as it went beyond that, much of it was permissive rather than mandatory; but the movement for primary reform, once well started, grew in both scope and geographical extent until at present there is on the statute books of the country a large amount of legislation which puts primaries under almost as strict state control as elections themselves. A marked feature of the past ten years, and particularly of the last two or three years, has been legislative provision for direct primaries in place of the caucus or convention system of selecting candidates. The author predicts that this system will soon extend over the whole country, except where nomination by petition prevails.

The history of the primary reform movement is here presented in considerable detail, and yet does not occupy a great amount of space. This is followed by summaries and conclusions which could scarcely fail to command the attention of any one who would read the first few paragraphs.

A number of appendixes give representative

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◆

Hobart on Heavy Electrical Engineering.

Reviewed by HENRY FLOY.*

HEAVY ELECTRICAL ENGINEERING.—By H. M. Hobart, M. Inst. C. E., M. Inst. E. E., M. Am. Inst. E. E., Consulting Engineer. New York: D. Van Nostrand Co. Cloth; 5¾ × 9 ins.; pp. 338; 188 illustrations, mostly in the text, and 96 tables. $4.50, net.

Under the title "Heavy Electrical Engineering" the author discusses steam electric-generating stations, high-tension transmission lines and electric-traction calculations and equipments. The first 100 pages of the book are devoted to introductory matter and a discussion of the efficiency and methods of steam-power generation. Then follow 50 pages on the design of generation stations, another 50 pages on high-tension power transmission lines and continuous-current, series systems. The closing 100 pages of the book treat of electric traction. A very complete index of 30 pages adds to the availability of the information given in the book.

The book is evidently intended, primarily, for engineers in Great Britain. This is indicated by the method of treatment and by the expression of costs in English currency. The book contains some most valuable tables, which have been carefully and laboriously worked out, and much valuable broad-gage engineering, evidently based on the author's wide experience. The chapters on electric generating plants and the design of generating stations are too short and could be profitably enlarged by the author. Numerous illustrations of actual power stations and tables and curves giving capacities, outputs, fuel consumption and similar data, are both interesting and valuable from an operating engineer's standpoint.

The author's use of the centigrade thermometer, the metric system and kilowatt hours—even as applied to latent heat vaporization—are certainly to be commended, although it makes the reading of the book more difficult for those not regularly using such units. Pressures expressed in kilograms per square centimeter, cross-section of copper conductors in square millimeters and the kilowatt hours of heat absorbed by a ton of circulating water give figures unusual to and not immediately appreciated by the average American reader.

The attempt to thoroughly discuss as broad a subject as "Heavy Electrical Engineering" within the covers of a single 300-page volume, must necessarily result in some superficiality, especially since the author not only includes such elementary engineering subjects as the relation between heat and temperature in water and steam, the calorific contents of fuel, diagrammatic charts of station power losses, but also discusses the pros and cons of various types of apparatus, both steam and electrical, that may be required in the largest generating stations, together with aerial and underground transmission circuits, electric railways and the electrification of steam roads.

The arrangement of the topics may be criticized, as in order to be certain that one has read all that the author may say about the comparative advantages of steam turbines or engines, or the relative disadvantages of the single-phase railway system, it is necessary to read through the entire book.

In view of the author's attempting the consideration of such a broad subject, his lack of reference to hydro-electric power development and station design, so important in most countries, and his very scanty reference to gas-engine operation, are serious omissions. The limitations of a particular make of steam turbine, mentioned by the author, emphasizes his failure to refer to another well-known make of turbine which overcomes some of these limitations.

The information on high-tension aerial transmission lines, taken almost exclusively from American practice, can hardly be considered up-

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to-date, and in accordance with our latest developments. No mention is made, for example, of the suspension type of insulator, or the highest voltage in use. The author does better with underground transmission work, but the cost of conduit construction taken from American experience and translated into English money, would seem to be hardly pertinent for conditions in Great Britain, where costs, particularly labor, are quite different from those in America. In fact, the cost of both aerial and conduit construction with underground cables given by the author, are, to say the least, ultra conservative. The author's contempt for the single-phase railway system leads him to statements which are contradicted by the demonstrated practicability and growing use of the single-phase system, under certain conditions, despite any inherent weaknesses that system may have.

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The Steam Turbine—Steam Production.

Reviewed by A. G. CHRISTIE.[*]

ZUR DAMPFTURBINENTHEORIE. — Verfahren zur Berechnung Vielstufiger Dampfturbinen. By Wilhelm Deinlein. Munich, Berlin: R. Oldenbourg. Cloth; 6½ × 9½ ins.; pp. 106; 51 illustrations in the text. 4 marks; American price, $1.60.

LA CONSOMMATION DES CHAUDIERES A VAPEUR ET L'ECONOMIE DE COMBUSTIBLE.—By D. Sidersky. Paris, France: Gauthier-Villars. Paper; 4½ × 7½ ins.; pp. 174; 27 illustrations in the text. 2½ francs; American price, 75 cts.

While none of the fundamental theory of the steam turbine presented in this German book is new, the simple and clear manner in which the author presents it is to be very highly commended. The book has evidently been written as an amplification of another work on the subject, to which reference is made in the introduction and which covered the elementary thermodynamic discussion and dealt with the simple impulse types of steam turbines.

The author confines himself to the treatment of the theory of heat, velocity and power changes in steam turbines with several pressure stages; two of these turbines are of the impulse type, the Rateau and the Zoelly, while the third is the Parsons reaction turbine. These are all classed as "turbines with pressure stages," since there is a drop in pressure, or, as the author considers it, a "drop in heat contents of the steam," between each row of moving blades.

All calculations are based on the state of the steam at any given point. This state of the steam is determined exclusively by the use of the Mollier Heat-Entropy diagram. The heat given up during any given expansion is read directly from the diagram. The fundamental equations representing energy transformation are developed in connection with velocity diagrams.

The author analyzes the steam changes in the turbine very carefully and thoroughly. Coefficients are introduced in the formulas to represent every loss met with in practice in the flow of steam through the blading. These coefficients are given some approximate values derived from practice, in order to illustrate the application of the formulas to steam turbine design.

In the first chapter the author derives the fundamental equations showing the relations of velocity and heat given up in the different stages of the turbine. In the derivation of formulas, the turbines are first considered without losses and afterwards the coefficients for friction and leakage losses are introduced. Three cases are considered throughout for all turbines: (1) Constant blade angles in a cylinder with increasing blade lengths; (2) constant blade lengths in a cylinder with increasing blade angles; (3) constant ratio of admission area to annular blade area with change either of blade length or blade angles or both.

The distinction made in the text between the Rateau and Zoelly turbines is as follows: The Rateau has many stages and its disks increase in diameter as the steam volume increases, the blade lengths are nearly constant and the ratio of admission area to annular blade area is large. The Zoelly has fewer stages than the Rateau, and all disks in a given cylinder have equal mean diameters; the length of the blades increases rapidly with increase of the volume of the steam, and the ratio of admission area to annular blade area is small.

The second chapter discusses the figuring of the blade rows in a cylinder by reversing the preceding solutions when certain sets of conditions are assumed, such as the number of rows and heat drop per row.

Chapter 3 deals with the theoretical considerations of the application of given blade cross-sections to the design. Chapter 4 discusses the design of new forms of blade cross-sections based upon theoretical considerations. The blading of each class of turbine is figured out in Chapter 5, to show the method of applying the derived formulas. Chapter 6 discusses the performance of various steam turbines operating with several different ratios of absolute pressure to specific volume of the steam at admission to the turbine. Some interesting tables are given in this connection, derived from actual tests.

The author is very careful to make every step of the discussion perfectly clear, and the reader is assisted in following it by the use of a large number of figures showing the steam expansion on the Mollier diagram, the velocity triangles, the blade angles, cross-sections, etc.

The methods of design outlined in this book could probably be used with profit by engineers in checking over new designs or for applying heat analysis to some given type of steam turbine already built. The growing importance of the Zoelly and Rateau turbines abroad and their introduction into this country should stimulate study of their theory which is so ably discussed in the above book.

Students in thermodynamics will find this book of value, not only on account of the simple logical treatment of the theory but also on account of easy application of the methods shown, to commercial design.

As the name implies, the French book before us deals with the conditions affecting the economical production of steam, the causes of poor efficiencies, and how these may be improved. It is a handbook prepared principally for the use of operating engineers or those in charge of industrial establishments. Hence all technical formulas and discussions are omitted. The facts bearing on the subject are clearly and simply stated and, from this standpoint alone, the book is superior to many of our books in English on this subject.

The author first discusses the installation of grates, furnaces, ash-pits and dampers, and gives some figures representing the best practice as regards sizes, distances from water heating surfaces, etc. Then follow several pages containing practical instructions for firemen with regard to methods of firing, cleaning fires and regulating draft. The volume of air theoretically required for perfect combustion, the volume actually used, the influence of air supply on economy and methods of calculating air supply are dealt with very fully.

Thermal losses, such as the heat carried away by flue gases, the heat loss due to incomplete combustion and the formation of CO, etc., and the influence of these losses on economy are next discussed. These losses are conveniently given in tabular form together with columns showing the cause of individual losses, and the means of reducing them.

The control of the thermal losses by draft regulation and by observation of flue temperatures is given next. Indicating and registering pyrometers are shown for this work, together with several very convenient draft gages.

For the sampling and analysis of flue gases several types of apparatus are described, among them the Orsat, Balliet, Hempel, and Sidersky. An automatic continuous sampler is described together with the following types of CO_2 indicators: the Siegert and Dürr, the Arndt, the Lux, the Krell-Schultze, and the Ados. The last-named resembles the Sarco apparatus used in this country.

The next chapter shows how to calculate the efficiency of the boiler and furnace. Then the European "International Laws for Testing Steam Boilers" are given in full, together with some additional notes on testing. The last chapter is devoted to the discussion of possible improvement of economy, brought about by careful selection of the fuel, by close control of the air supplied to the furnace, by the use of improved types of furnace, such as Dutch Ovens, Parsons systems, Pouillier systems, mechanical stokers, and by the use of economizers.

The French laws governing the operation of steam boilers are included in the Appendix, together with a number of interesting and useful tables giving calorific values of fuels, etc.

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THE EARNING POWER OF RAILROADS.—1909. Compiled and Edited by Floyd W. Mundy, of Jas. H. Oliphant & Co. New York: Jas. H. Oliphant & Co. Cloth; 4¾ × 7½ ins.; pp. 428. $2.

This book is intended for the use of investors in railway securities. The statistics of the earnings of 138 railway companies given in the book are presented in a new way. The first ten chapters or 50 pages of the book are devoted to an explanation of the basis on which it has been compiled. The remainder of the book is made up of tabular summaries of earnings, expenses, dividend and other payments, prepared from the figures given in annual reports of the companies.

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PROFESSIONAL MEMOIRS.—Engineer Bureau, United States Army. Published Quarterly at the Engineer School, Washington Barracks, D. C., by the School Board. Vol. I., Nos. 1 and 2. Paper; 6 × 9 ins.; pp. 192; illustrated. $1.25 per copy; $5 per year.

The Engineer School of the United States Army at Washington, D. C., has recently begun the publication of a quarterly periodical entitled "Professional Memoirs." The purpose of the periodical is to publish matter of especial interest to the engineers engaged in work under the Corps of Engineers, including some of the important lectures delivered at the United States Engineer School.

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DEPARTMENT OF RAILWAYS AND CANALS (Canada).—Annual Report for the Fiscal Period from April 1, 1907, to March 31, 1908. (George P. Graham, Minister of Railways and Canals.) Ottawa, Canada: Pub. Doc. Paper; 6½ × 9½ ins.; pp. lxviii + 377; ten maps in separate envelope.

This report summarizes the work of the Canadian Department of Railways and Canals, which is under the charge of the Deputy Minister and Chief Engineer, Hon. M. J. Butler, M. Can. Soc. C. E. The report contains valuable information regarding the Canadian canals and Canadian railways, with the reports of traffic, etc. The section devoted to the new work which is going on upon the new Canadian transcontinental road, the Grand Trunk Pacific, is of special interest.

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[*] Research Assistant in Engineering, University of Wisconsin, Madison, Wis.

A British Book on Electric Lamps.

ELECTRIC LAMPS.—By Maurice Solomon, Asoc. M. Inst. E. E. New York: D. Van Nostrand Co. Cloth; 5½ × 8½ ins.; pp. 321; 1 plate, 112 text illustrations and 34 tables. $2, net.

This addition to the "Westminster Lines" of technical works, for British readers particularly, has kept to the high standard of previous volumes. The descriptions are concise for the most part and evidently accurate. What is written naturally shows transatlantic applications better than American.

The book opens with a few pages on the requirements of good artificial illumination, with particular reference to distribution, intensity and color. In a chapter on light production, the author discusses selective radiation, the radiation of energy at different parts of the spectroscopic scale and other points related more to pure physics than to practical illumination.

There is a chapter on the photometric study of light sources in general and in particular. The principles of several of the more common photometers are outlined. This is followed with a few pages on rather commercial tests and the interpretation of results. The two most important classes of tests are given rather full discussion. These are tests to determine the distribution of light and the specific consumption of energy—the latter often miscalled "efficiency."

This matter, noted so far, fills only about a third of the volume. The remainder gives the book its title, being descriptive of the manufacture and performance of the various electric lamps commercially available. The author has excluded the partially developed types not on the open market. The following lamps are taken up in the order given: the carbon, Nernst, osmium, tantalum and tungsten-incandescent, the numerous arcs and the vapor and vacuum-tube contrivances. The many and involved phenomena of the electric arc are discussed rather fully, researches of Mrs. H. Ayrton and Mr. W. Duddell being drawn upon rather freely. The last chapter of the book is a general comparison of all the lamps described and discussed separately, earlier in the book. Their respective suitability for certain kinds of localities and their costs are the main items here.

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STATE WATER SUPPLY COMMISSION (New York).—Annual Report for the Year Ending Feb. 1, 1909. (Henry H. Persons, President of Commission.) Albany, N. Y.: Pub. Doc. Cloth; 5¾ × 9 ins.; pp. 796; numerous folding and other plates; maps and profiles in separate folio.

The water-supply of cities, river improvement, and water storage power development, in New York State are each considered in this volume, storage and power having by far the largest amount of space. Some of the main features of that portion of the report dealing with storage and power development were abstracted at length and were also commented upon editorially in our issue of Feb. 18, 1909. Besides the Commission's report on water storage and power development, there is a general review of the engineering studies of the year 1908 made by Mr. John R. Freeman, M. Am. Soc. C. E., Consulting Hydraulic Engineer. There are also detailed reports on the work of the year by Mr. Walter McCulloh, M. Am. Soc. C. E., Consulting Engineer, and Mr. Horace Ropes, M. Am. Soc. C. E., Special Deputy Engineer. Appendixes contain a report by Mr. H. K. Barrows, M. Am. Soc. C. E., District Engineer, U. S. Geological Survey, on cooperative stream flow studies, and also the results of a water-power census of New York State, presented of course in tabular form. Numerous half-tone views enliven the pages of the main report; in addition, many maps and diagrams are given in the main report, and also in the accompanying portfolio.

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OFFICIAL YEAR BOOK OF THE COMMONWEALTH OF AUSTRALIA.—Containing Authoritative Statistics for the Period 1901-1908 and Corrected Statistics for the Period 1788-1900. No. 2, 1909. Published under the authority of the Minister of Home Affairs, by G. H. Knibbs, Commonwealth Statistician. Melbourne, Australia: Pub. Doc. Boards; 6 × 9¾ ins.; pp. 1,159; maps and diagrams.

A vast mass of information in the form of statistics, text and diagrams is here given. There is a considerable amount of text, much of which

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is of interest for general reading and all of which is of value for reference purposes. Matter relating to the history and government of the commonwealth and its component parts is given, as well as information on physiography, population, vital statistics, land tenure and settlement, agriculture, mining and manufacturing, commerce, transportation facilities, defense and local government.

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A Defense of the Canal Policy of New York State.

WATERWAYS AND CANAL CONSTRUCTION IN NEW YORK STATE.—An Historical Review. By Henry Wayland Hill, LL. D. Buffalo, N. Y.: Buffalo Historical Society. Paper; 6¼ x 9¼ ins.; pp. 549; folding map and portrait. Paper, $4, net; cloth, $5, net.

Since the formation of the commonwealth the political and financial activities of the State of New York have been intimately concerned with the construction and development of the canal systems of the state. Starting in the early days of the last century, with the wonderfully successful Erie Canal, to which the commercial supremacy of ante-railroad New York is undoubtedly due, following through the succeeding years with their bubble-schemes of over-exploited lateral canals to the present with its 1,000-ton barge waterway now in the course of construction, hardly a legislature has met which has not discussed, and discussed acrimoniously, some new canal legislation or scheme. The history of these canals has until recently been available only to the student; the contemporaneous newspaper and the legislative record is of small value to the ordinary man. Within the past two years, however, two books have appeared, which, taken together, form a most complete and interesting history of these waterways. The first is the History of the Canal System of the State of New York, by Mr. Noble A. Whitford, published in 1906 as a supplement to the Annual Report, for 1905, of the State Engineer and Surveyor (reviewed in Eng. News, Oct. 17, 1907, p. 419). The second is the book noted at the head of this review.

Although the two books conflict in parts, there is a distinct difference in the intents of the two authors. Mr. Whitford is an engineer and deals more specifically with engineering problems of the canals and with the famous men whose labors on the Erie Canal did much to bring engineering from a trade to a profession. Mr. Hill is a senator in the New York State Legislature, with which body he has been connected, representing Buffalo either as assemblyman or senator, for 13 years. Naturally, his training and disposition would lead him to consider the development of canal legislation, with its accompanying financial and commercial aspects. Furthermore, Senator Hill has been the leader in the vigorous campaign that has been waged in the past decade to increase the old Erie Canal to accommodate 1,000-ton barges, so this latest improvement necessarily receives the major part of the attention of the author.

Of the 27 chapters of the book, the first five are devoted to a history of the waterways of the state and of the very earliest canals; the next seven chapters discuss the Erie Canal from the dreams of the 18th century colonist to the opening in 1825 of DeWitt Clinton's "Grand" canal; the next five chapters treat of the rapid growth of lateral canals in the ensuing 30 years and of the gradual decline in canal traffic due to the inroads of the railway; the final ten chapters are on the movement which culminated in the Barge Canal legislation and popular endorsement of 1903.

In an editorial preface written for the Buffalo Historical Society, under the auspices of which the history is published, the following statement appears:

> That Senator Hill writes as an ardent advocate of [New York's canal] policy, and a thorough believer in its wisdom, is apparent on a perusal of his pages; but no reader is likely to accuse him of unfairness in his presentation of facts. He has been at pains to give due recognition to the opposition to the barge canal measures, whether that opposition was expressed in the Legislature, by citizens who may or may not have been influenced by railroad or other interests supposedly hostile to the canals, or by the press. Indeed, this impartial record of the anti-canal forces and methods employed in the memorable campaign of 1903, is one of the features which gives to the present chronicle a peculiar value.

We would hardly go so far as to call Senator Hill's book "unfair," but we do deny its impartiality. The lapse of time has shown that there was only one side to the canal arguments of the early days. The opponents of the Erie Canal were unquestionably wrong. But the later-day enthusiasts have only theories to back their arguments, and until time solves the problem, a true historian is bound to present both sides of the question. In his earlier chapters, then, Senator Hill is most happy, because he is there discussing historical facts which no one can deny. But once his history gets to that time when the railway influence on the canal is felt, his enthusiastic partisanship overcomes his historical disinterest.

Thus hardly any attention is paid to the promotion of canals in the middle third of the last century, when wild-cat schemes flooded the country and citizens went crazy to sink their money in canals which had no valid excuse either from a commercial or an engineering standpoint. So, later, in the discussion of the Barge Canal the previously uninformed reader would judge from the narrative that the only opposition to the Barge Canal as it finally was adopted, came from the railway interests, or from those whose sense of anticipated personal benefit greatly overshadowed a desire for public good. Readers of Engineering News will remember that among engineers, who were probably the most disinterested of any profession or business in the state, there was a decided opposition to the Barge Canal. Such fair-minded opposition is not considered in Senator Hill's book, or is noted but to be condemned. For instance, in commenting upon anti-canal utterances, which are sometimes reprinted and sometimes not, there appear such sentences as:

> The figures, however, presented were themselves compiled by anti-canal workers, said to be largely under railway domination, and would not bear analysis or close scrutiny.

or

> Some of the arguments were not germane to the questions involved, and all of them more or less impracticable or visionary.

This continual tendency to asperse the quality and honesty of the anti-canal sentiment is not worthy a true historian, nor a publication of a historical society, but is, of course, to be expected from one who has borne so prominent a part in the recent pro-canal activities of the state. We would suggest, however, a change of title to the more accurate, "A Defense of the Canal Policy of New York State."

Bearing in mind these limitations of the author, which only affect the latter part of the book, the history is most interesting as an account of the legislative development of projects which are essentially of an engineering nature. With Mr. Whitford's book for the engineering history and Senator Hill's for the legal and economic, a reader should gain a most concise knowledge of the internal waterways of the great State of New York.

Robert Fulton, Engineer.

HUDSON AND FULTON.—A Brief History of Henry Hudson and Robert Fulton, with Suggestions Designed to Aid the Holding of General Commemorative Exercises and Children's Festivals during the Hudson-Fulton Celebration in 1909. By Edward Hagaman Hall. Second edition. New York: The Hudson-Fulton Celebration Commission. Paper; 6 x 9 ins.; pp. 74; folding and other plates.

The elaborate celebration planned for the two weeks, from Sept. 25 to Oct. 9, 1909, is arousing increasing interest in the work of Henry Hudson, as a navigator and an explorer, and of Robert Fulton as an inventor and an engineer. The greatest interest of readers of these columns naturally will be in that part of this booklet which relates to Fulton. Mr. Hall has drawn together, and given in interesting form, the greater things of Fulton's life and work. Recent researches about the construction of the famous steamer "Clermont" seem to have given us more certain data about the boat. Mr. Hall does not fail to give credit to the builders of the 14 partially successful American steamboats that preceded the "Clermont," and places the work of its designer only where it can fairly be judged to stand among all the others. Fulton's alliance with Chancellor Livingston and the commercial success of the combination are shown as an important factor in the development of steam navigation.

Concerning the life of Henry Hudson, the great navigator, little can be said by anyone. The few available facts are given here with some speculation about his friends and folks. This part of Mr. Hall's booklet deals briefly with Hudson's three attempts to find a short cut to China other than the one that resulted in the exploration of the Hudson River. The famous voyage of 1609 is given in greater length and will be found pleasant and profitable reading.

The tentative program of the celebration is given at the end of the volume with the suggestions of the Celebration Commission for commemorative exercises and festivals.

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THE DISINFECTION OF SEWAGE AND SEWAGE FILTER EFFLUENTS.—With a Chapter on the Putrescibility and Stability of Sewage Effluents. By Earle Bernard Phelps. Water-Supply Paper 229, U. S. Geological Survey; George Otis Smith, Director. Washington, D. C.: Pub. Doc. Paper; 5¾ x 9 ins.; pp. 91; 1 plate and 39 tables.

Prof. Phelps here continues his interesting and valuable reports on his studies of the disinfection of sewage, made by him at the sanitary research laboratory and sewage experiment station of the Massachusetts Institute of Technology at Boston, and also at Red Bank and Baltimore. The experiments at the two last-named places were made in collaboration with Mr. Francis E. Daniels and Mr. Ezra B. Whitman, respectively, under cooperative agreements between the Institute of Technology, the State Sewerage Commission of New Jersey, and the city Sewerage Commission of Baltimore. The conclusions of the study are in favor of hypochlorite of calcium as a disinfectant. Estimated costs of disinfecting sewage effluents under different conditions are given. The section of the report dealing with

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putrescibility defines putrescibility, relative stability and other terms necessary to an intelligent discussion of the subject. A method for making relative stability tests is briefly outlined. In conclusion Prof. Phelps states:

> In general, effluents having a relative stability greater than 90% may be discharged into any stream without danger of their consuming any of the oxygen of the water, because effluents of such high stability will retain oxygen indefinitely on exposure to the air.

◆

Important Revisions in Steam Tables.

TABLES OF THE PROPERTIES OF STEAM AND OTHER VAPORS.—And Temperature-Entropy Table. By Cecil H. Peabody, Professor of Naval Architecture and Marine Engineering, Massachusetts Institute of Technology. Eighth edition, rewritten. New York: John Wiley & Sons. London, England: Chapman & Hall, Ltd. Cloth; 5¾ × 9¼ ins.; pp. 133; two figures in the text. $1; English price, 4s. 6d., net.

Dr. H. N. Davis, of Harvard University, presented a paper on "The Total Heat of Saturated Steam," before the annual meting of the American Society of Mechanical Engineers, Dec. 1, 1908. Prof. Peabody, in discussing the author's study of Regnault's classic data said that the results of the new work were concordant and to be accepted. He said that it would be necessary to recompute the present steam tables, as for all practical purposes there could be considered to be an error of 0.5% in the middle range of total-heat figures. He also said that the recently-made temperature-entropy tables needed correction in their figures for quality or dryness. This paper and Prof. Peabody's discussion were noted, in a report of this meeting, in Engineering News, Dec. 10, 1908, p. 656, and may be found complete in the Transactions of the American Society of Mechanical Engineers for 1908.

The researches of Holborn and Henning, on the relations between pressure and temperature of saturated steam, have been incorporated. These values show a difference of about 0.05% from the values given in the 1907 edition of Peabody's tables.

A detailed comparison of the old and the new tables shows small changes throughout the entire collection. A vast amount of work seems to have been done in thus bringing these important tables in accord with latest knowledge.

Every one having much work in steam engineering will probably desire one of the revised tables, though the final accuracy of working up commercial test data, with the older tables, will not be appreciably affected. Engineers are generally agreed that the data on which the new tables rest are in such close agreement that any future determinations will not make another revision necessary. Therefore those who need these new tables may purchase without fear of having the book superseded in a few years more. The original data, on which the tables are based, are presented and discussed in the author's introduction so that each user who chooses may decide for himself what accuracy he desires to attribute to the data and tables.

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Publications Received.

AMERICAN NEWSPAPER ANNUAL.—Containing a Catalog of American Newspapers, [and] a Description of Every Place in the United States and Canada in Which a Newspaper is Published. Philadelphia, Pa.: N. W. Ayer & Son. Cloth; 6¼ × 10 ins.; pp. 1,350; 61 maps. $5, net.

THE BEAUTIFYING OF SAN JOSE.—A Report to The Outdoor Art League by Charles Mulford Robinson (Rochester, N. Y.). Paper; 7½ × 9¾ ins.; pp. 39; illustrated.

BROOKLYN ENGINEERS' CLUB.—Proceedings for 1908, Constitution and By-Laws, and Catalog of Reference Works Added to the Library During the Year. Brooklyn, N. Y.: The Club (Joseph Strachan, Secy., 197 Montague St.). Cloth; 5¾ × 9¼ ins.; pp. 418; numerous folding and other plates. $2.

BULLETINS, U. S. GEOLOGICAL SURVEY.—George Otis Smith, Director. Advance Chapters from Bulletin No. 380, Contributions to Economic Geology, 1908, Part I. Washington, D. C.: Pub. Doc. Paper; 5¾ × 9 ins.

380-H: Investigations Relating to Asphalt, by the United States Geological Survey in 1908. By Robert Anderson and J. A. Taff. Pp. 18; one map in the text.

380-I: Investigations Relating to Building Stones, by the United States Geological Survey in 1908. By Sidney Paige. Pp. 17; two figures in the text.

380-J: Investigations Relating to Cement and Concrete Materials, by the United States Geological Survey in 1908. By G. C. Martin, L. J. Pepperberg and Charles Butts. Pp. 34; two maps in the text.

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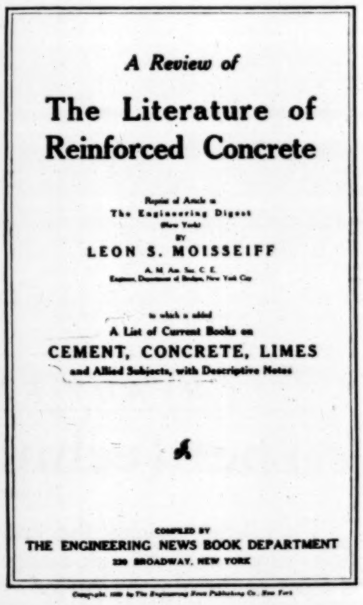

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CHAPTERS ON MUNICIPAL ADMINISTRATION AND ACCOUNTING.—By Frederick A. Cleveland, Ph.D., Director of the Bureau of Municipal Research. New York, London and Bombay: Longmans, Green & Co. Cloth; 5¼ × 8 ins.; pp. 361. $2, net.

CITY REFUSE AND ITS DISPOSAL.—Abstract of a Lecture Delivered before the Students of the Rensselaer Polytechnic Institute, Troy, N. Y., April, 1909. By H. De B. Parsons, Lecturer on Steam Engineering, R. P. I. New York: The Author (22 William St.). Paper; 4¾ × 7 ins.; pp. 18.

CIVIL SERVICE COMMISSION (Massachusetts).—Annual Report from Oct. 1, 1907, to Sept. 30, 1908, Inclusive. (Warren P. Dudley, Secy., Boston, Mass.) Boston, Mass.: Pub. Doc. (No. 53). Paper; 5¾ × 9 ins.; pp. 236.

CONNECTICUT STATE BOARD OF HEALTH.—30th Report (First Biennial), for the Two Years Ending Sept. 30, 1908. (Dr. J. H. Townsend, Secy., Hartford, Conn.) Hartford, Conn.: Pub. Doc. (No 25). Cloth; 5¾ × 9¼ ins.; pp. 253; diagrams.

THE DRESSING OF MINERALS.—By Henry Louis, M. Inst. C. E., M. Inst. M. E., M. Am. Inst. M. E., etc., Professor of Mining and William Cochrane Lecturer on Metallurgy at Armstrong College in the University of Durham, Author of "A Handbook of Gold-Milling," etc. New York: Longmans, Green & Co. London, England: Edward Arnold. Cloth; 6¾ × 10 ins.; pp. 544; 416 illustrations, partly in the text. $8.50, net.

ELECTRO-MAGNETIC ORE SEPARATION.—By C. Godfrey Gunther. New York and London: Hill Publishing Co. Cloth; 6 × 9½ ins.; pp. 193; 81 illustrations in the text. $3, net.

AN ELEMENTARY TREATMENT OF THE THEORY OF SPINNING TOPS AND GYROSCOPIC MOTION.—By Harold Crabtree, M. A., Assistant Master at Charterhouse. London, New York and Bombay: Longmans, Green & Co. Cloth; 6 × 9 ins.; pp. 140; 3 plates and 77 text illustrations. $1.50, net.

FIRE PREVENTION ALONG THE LINES OF THE RAILROADS IN THE ADIRONDACK FOREST PRESERVE.—Opinion of New York State Public Service Commission, Second District. Albany, N. Y.: Pub. Doc. Paper; 5¾ × 9 ins.; pp. 95; one folding sheet.

GEOLOGIC ATLAS OF THE UNITED STATES.—U. S. Geological Survey, George Otis Smith, Director. Washington, D. C.: Pub. Doc. Stiff paper; 18½ × 21¾ ins.

No. 164: Belle Fourche Folio. South Dakota. Pp. 9; four plates and one text figure.

No. 165: Aberdeen-Redfield Folio. Northville, Aberdeen, Redfield and Byron Quadrangles, South Dakota. Pp. 13; 12 plates and 14 text figures.

HANDBUCH ZUM ENTWERFEN REGELSPURIGER DAMPF-LOKOMOTIVEN.—By Georg Lotter, Munich and Berlin, Germany: R. Oldenbourg. Cloth; 5¼ × 8½ ins.; pp. 266; 136 illustrations in the text. 8 marks; American price, $3.20.

HOW TO USE SLIDE RULES.—By D. Petri-Palmedo. Second revised edition. New York: Kolesch & Co. Flexible cloth; 4 × 6¾ ins.; pp. 65; 33 illustrations in the text. 50 cts.

HYPSOMETRY.—Precise Leveling in the United States, 1903-1907. With a Readjustment of the Level Net and Resulting Elevations. By John F. Hayford, Inspector of Geodetic Work, Assistant, Coast and Geodetic Survey, and L. Pike, Computer, Coast and Geodetic Survey. U. S. Coast and Geodetic Survey, O. H. Tittmann, Superintendent. Washington, D. C.: Pub. Doc. Paper; 9¼ × 11½ ins.; pp. 280; one folding map and numerous tables.

THE INFLUENCE OF MUSCULAR AND MENTAL WORK ON METABOLISM.—And The Efficiency of the Human Body as a Machine. By Francis G. Benedict, Ph.D., Director of Nutrition Laboratory of Carnegie Institution of Washington, and Thorne M. Carpenter, Chemist of Nutrition Laboratory of Carnegie Institution of Washington. Bulletin 208, Office of Experiment Stations; A. C. True, Director. Washington, D. C.: Pub. Doc. Paper; 5¾ × 9¼ ins.; pp. 100; three illustrations in the text.

INTRODUCTION TO THE CHEMISTRY AND PHYSICS OF BUILDING MATERIALS.—By Alan E. Munby, Author of "Simple Experiments in Magnetism and Electricity," etc. New York: D. Van Nostrand Co. Cloth; 5½ × 8¼ ins.; pp. 345; nine illustrations in the text. $2, net.

THE MANUAL OF STATISTICS.—Stock Exchange Hand-Book, 1909. New York: The Manual of Statistics Co. Cloth; 5¼ × 8 ins.; pp. 1,094; folding maps.

NATAL GOVERNMENT RAILWAYS.—Report of the General Manager for the Year 1908. Pietermaritzburg, Natal: Pub. Doc. Paper; 8¼ × 13 ins.; pp. 63; map, traffic diagrams and tables of statistics.

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